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EXCAVATING ENGINEER

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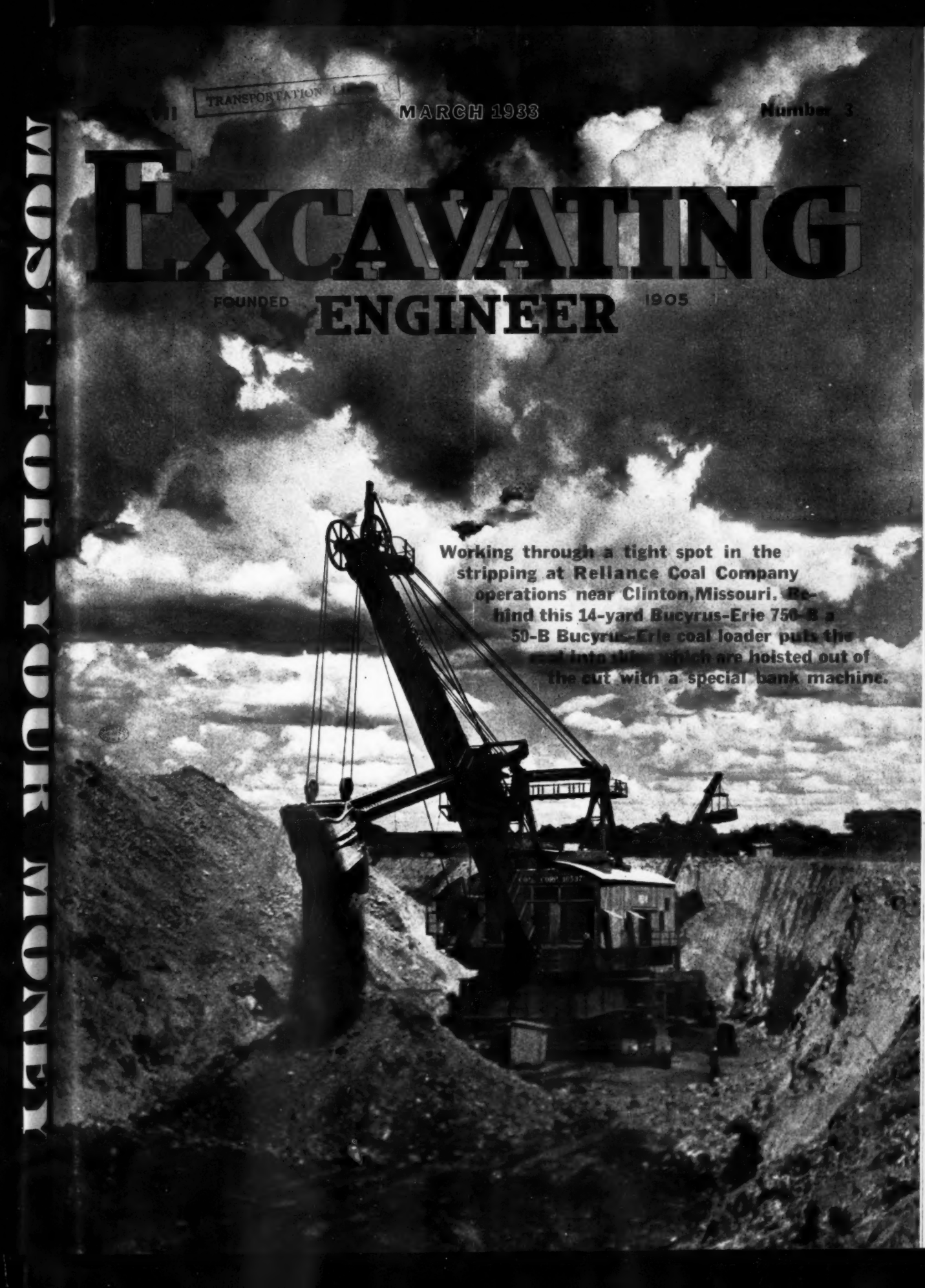

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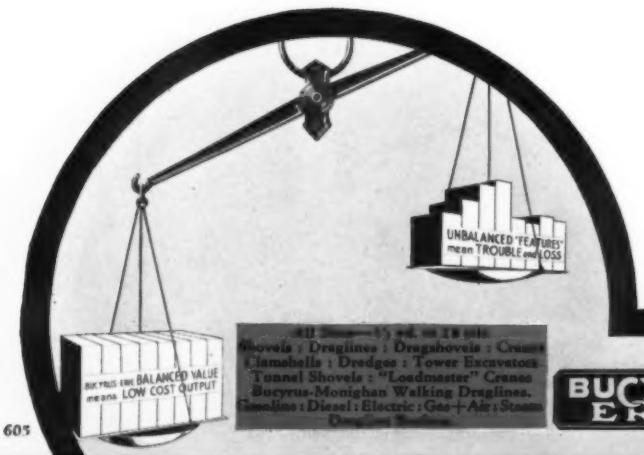

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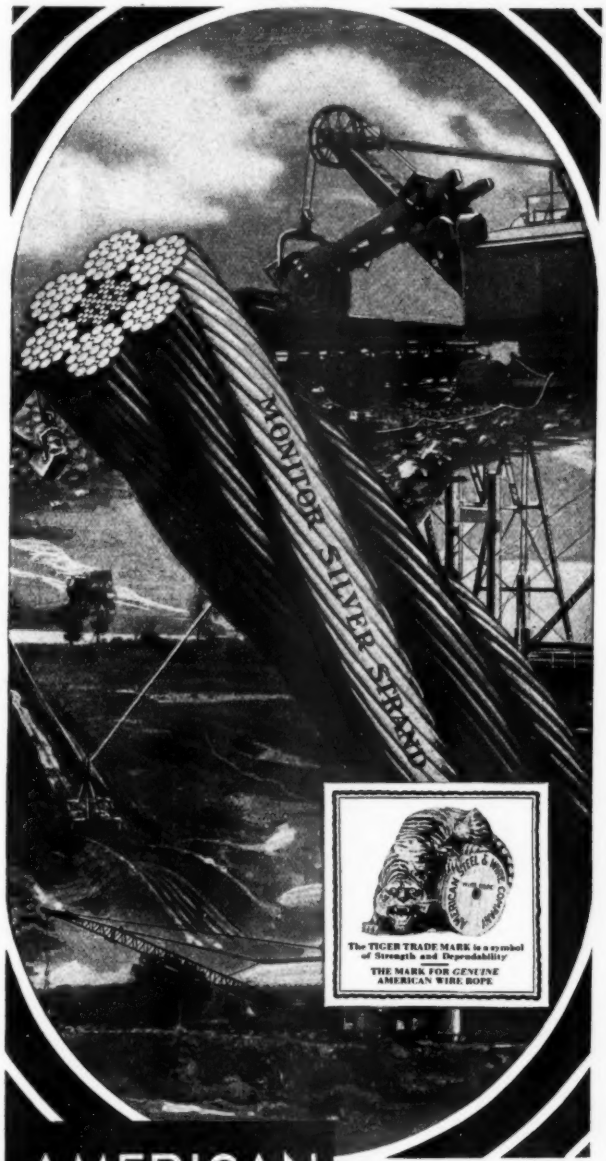
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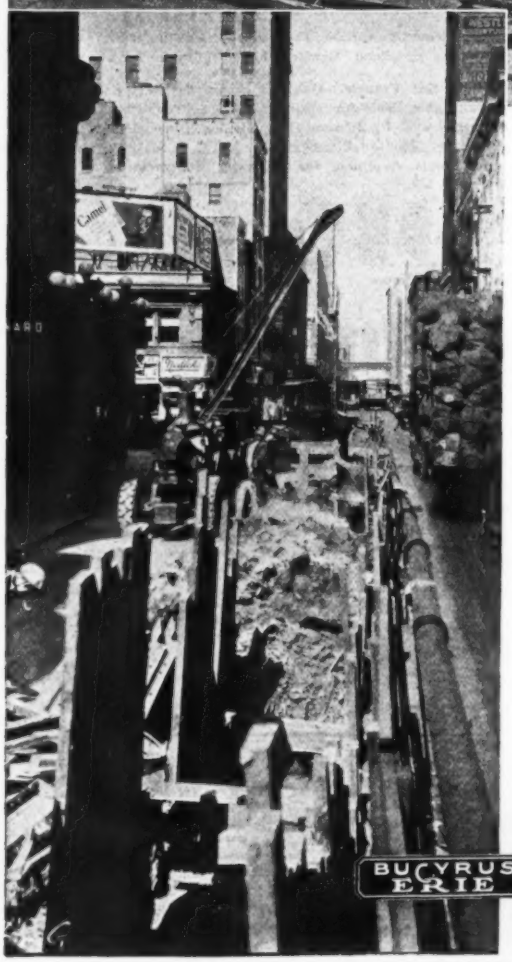

PLENTY of grief burdens the contractor who ties up traffic entitled to a right of way through his job. Yet subways must be built, new sewers laid; transformers, underground systems, street lighting standards have to be installed. And the taxpayers cuss the contractor and the public officials because of their delay and inconvenience. But what hurts you most is the dollars wasted while trucks and cranes stand idle waiting for traffic to pass.

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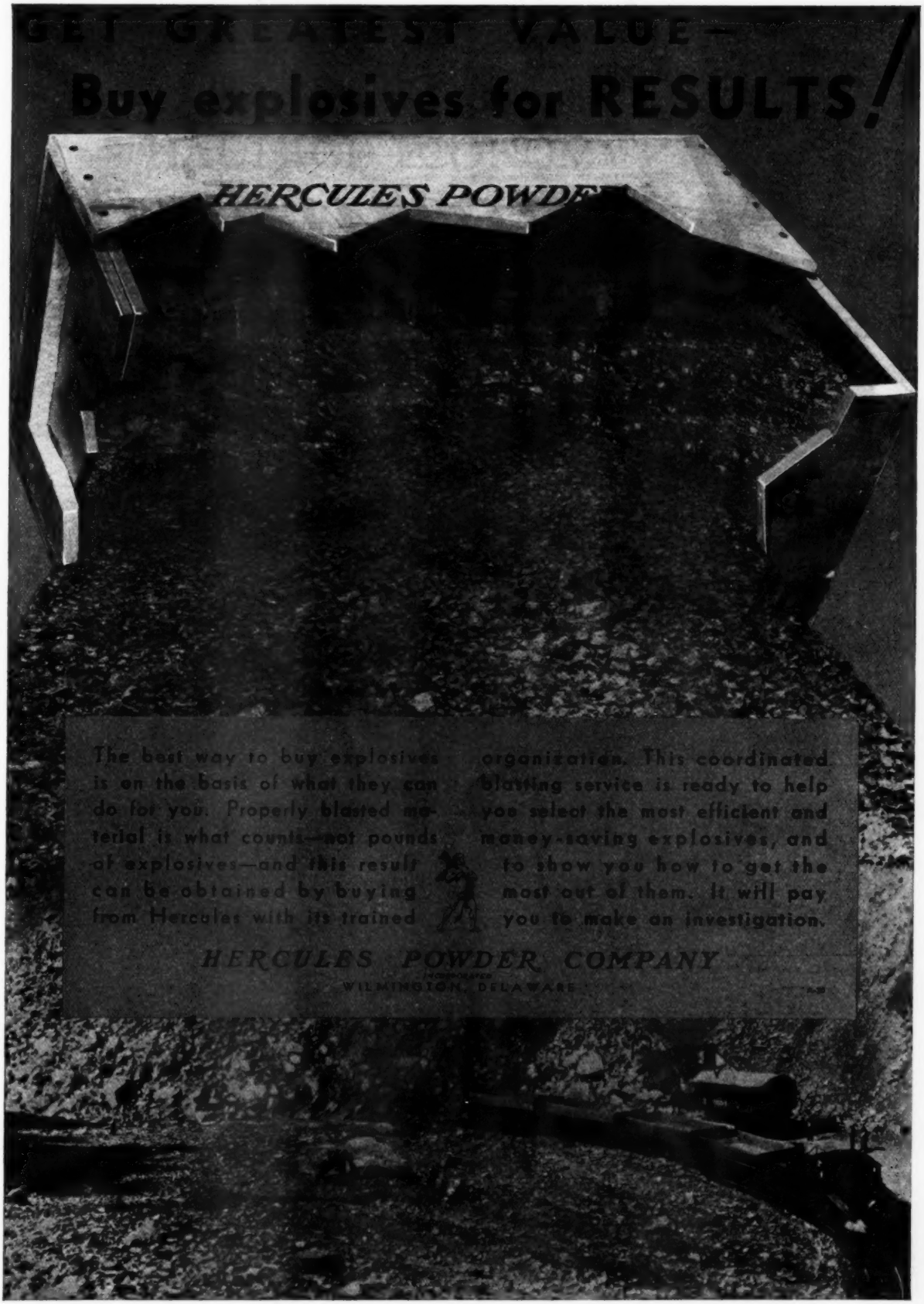
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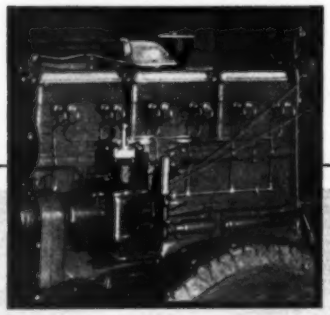

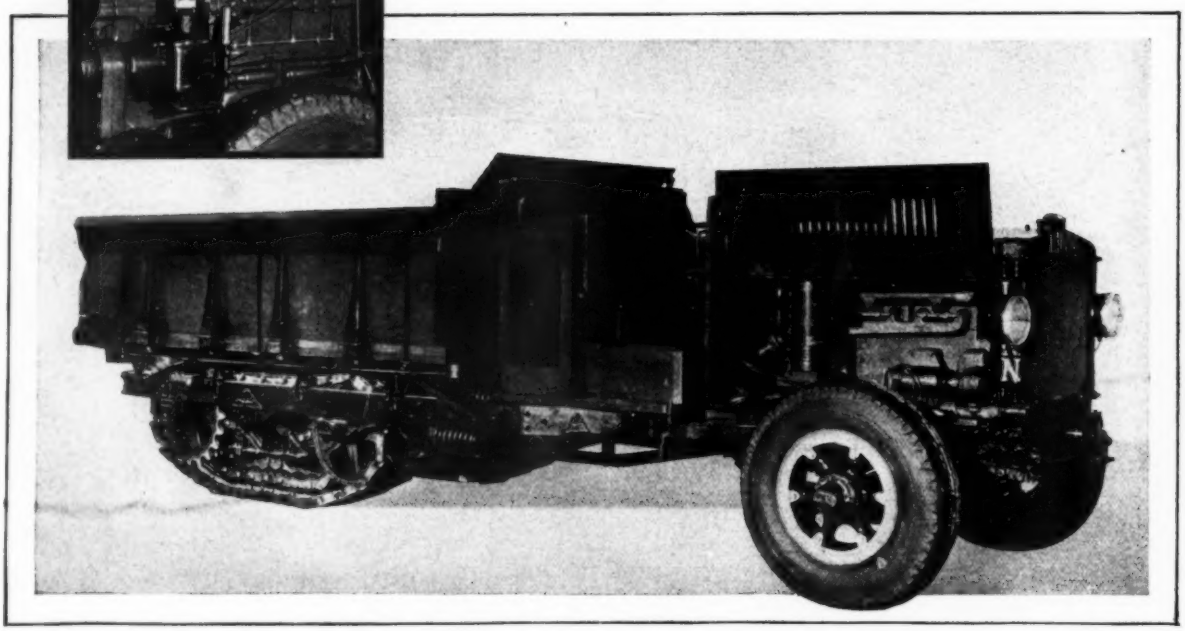

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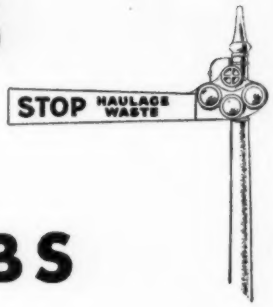
the Lessons of HAULAGE ECONOMY with WHITCOMBS



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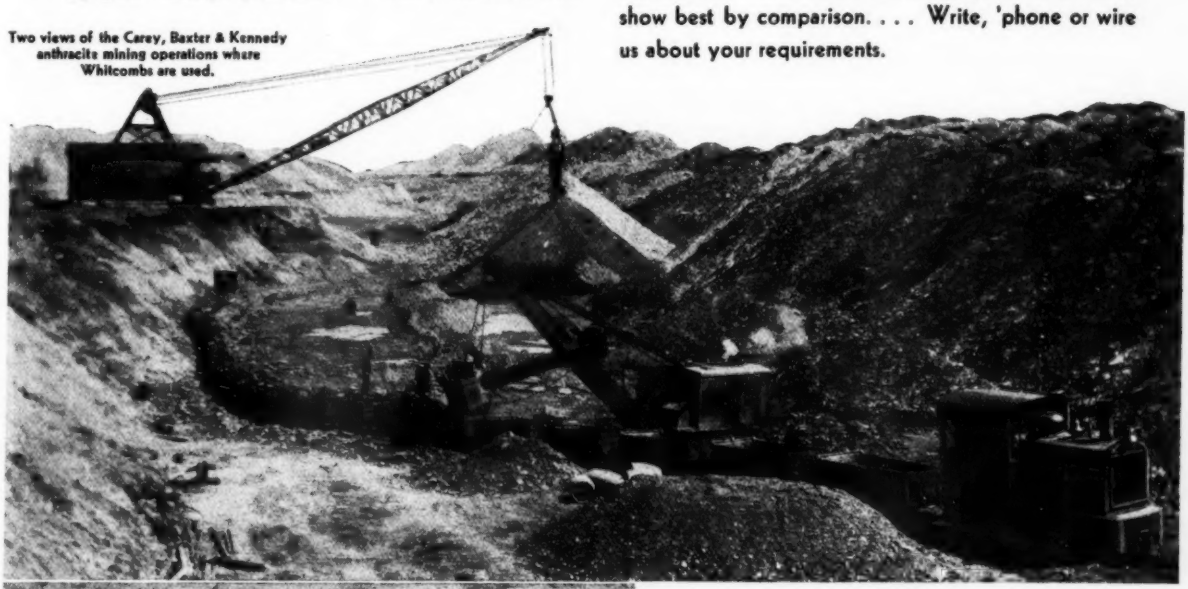
Two views of the Carey, Baxter & Kennedy anthracite mining operations where Whitcombs are used.



Prominent Contractors Buy Five MORE Whitcombs

Carey, Baxter & Kennedy, well known contracting firm of New York City, recently purchased five more Whitcomb 20-ton internal combustion locomotives for their stripping operations in the anthracite region. In a recent letter, Mr. Baxter compliments the Whitcomb in the following words:

"You will recall that we have owned Locomotives made by you since along about 1923, and I take pleasure in saying that we have never had any better locomotives than those made by your company, and have never had one of them develop any defects .... the numerous locomotives we have purchased from your company have never failed to give entire satisfaction."

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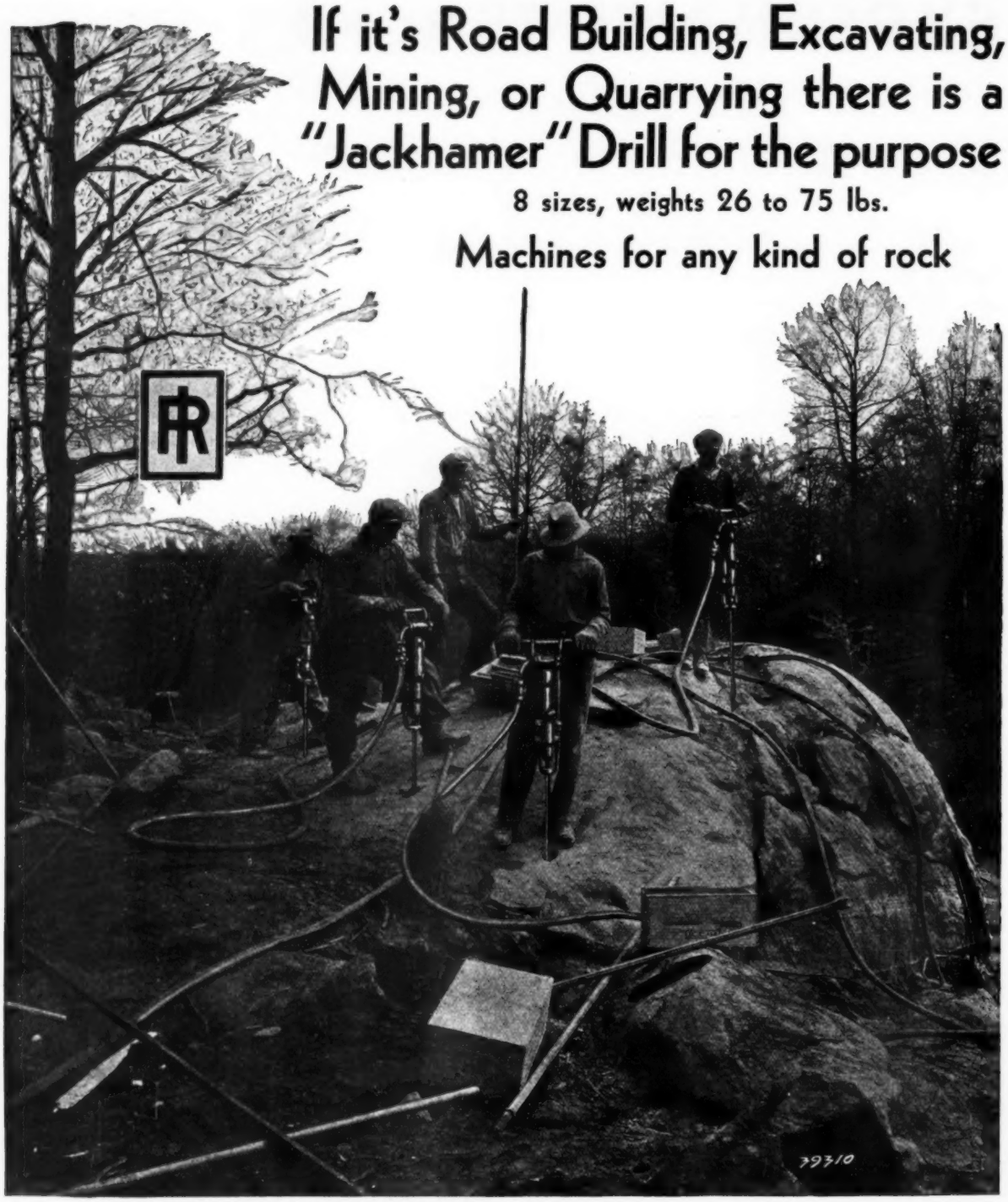

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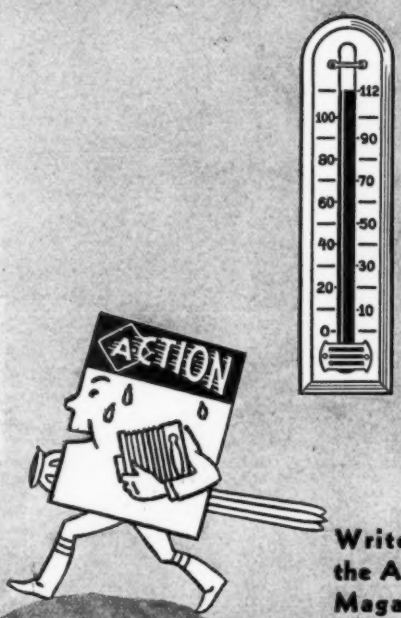

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These aviation pictures tell the story. Above: Four new piers to facilitate handling an annual tonnage of between 600,000 and 700,000 by the Peruvian port of Callao. Behind the new piers may be seen the two million cubic yard fill—"made land" to avoid the cost of condemning waterfront property and to provide ample switching yards for rail approaches, etc. These improvements lie within a quiet basin formed by a heavy rock breakwater three miles in length. Below: Five miles from the new harbor development, two 3-yard shovels sheared off the side of a mountain to furnish 1,251,728 cubic meters of hard igneous rock for breakwaters and rock walls.

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Improving the Peruvian Port of Callao

Finishing up a cut. Note the peculiar rock formation.

Frederick Snare Corporation, famous international contractors and engineers, moves over million and a quarter cubic yards of rock in bringing famous old harbor up to date.

by **SVERRE A. WEE, Mining Engineer**

THE INCREASING number of American travellers that pass through the Panama Canal yearly and turn south down along the west coast of South America in pursuit of business or pleasure, readily note the great efforts that have been taken to improve the old Spanish ports on this route in the last ten to fifteen years.

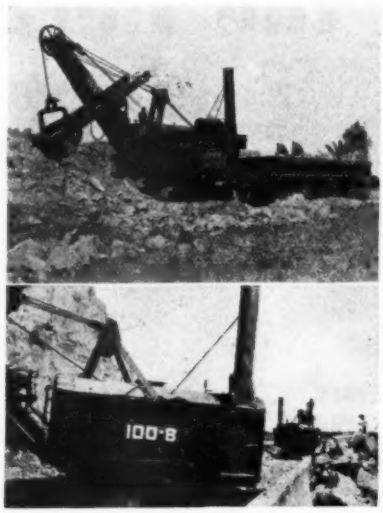
We touch first at Buenaventura, Colombia, two days south of the Canal. Once a congested, overworked port, it is now in possession of a nice long wharf with spacious warehouses to handle the Pacific trade of Colombia. At an approximate cost of five million dollars the Raymond Construction Company finished this job for the Colombian government. Further south, but now in Peru, we find the splendid docks of Callao now nearing completion, a generous undertaking involving about eight million dollars, also constructed by an American firm, Frederick Snare Corporation of New York City. If we travel on down south we pass Iquique, Antofagasta and lastly arrive at Valparaiso in Chile, where the Chilean government has spent a total of 40 million dollars in building protected harbors with modern docking facilities. Other improvements are planned, like that of the port of Tocopilla, the very heart of the American interests in the resurrected nitrate industry. These are awaiting more favorable times to be put into construction.

This long line of harbor improvements is identical with the great post-war expansion of South America, and synchronic with Uncle Sam's growing interest in the West-coast trade. They are urgently needed as practically all West-coast ports are open roadsteads unprotected against the abnormal seas and storms, generally called "Bravezas," that periodically rise in the Pacific and sweep its shores with terrific force.

The roadstead of Callao is one of the best protected natural harbors on the West Coast. Here congregated in by-gone days hundreds of sailing vessels, waiting for their chance to load guano or saltpeter and race around the Horn to Europe or United States with their cargoes. Towards the south and the southwest the harbor is protected by a tongue of land and two islands against the most prevailing winds and seas, but it lies open to the north and west. And unfortunately the heavy ground swell, generally from the southwest finds its way in from the open northwest side, by turning around the point of San Lorenzo Island. This ground swell, a peculiarity of the Pacific Ocean and a direct product of the Humboldt Stream from the Antarctic, makes itself felt even in quiet days and considerably hampers discharging and loading of steamers anchored in the bay or tied up alongside the old docks. The different Peruvian Governments for the last twenty years had therefore seriously considered the construction of docks to replace those that were built by a French company about 50 years ago under a special concession, which was to expire in 1933. The old docks were inadequate in con-

struction and approach and could only accommodate ships with a draft less than twenty feet. It therefore developed into general practice that the major part of the freight and all passenger steamers discharged their cargo and passengers in the open bay. With practically 70 per cent of the total cargo being handled in this way and with a custom house located about one mile inland, in the heart of the town, most of the cargo was rehandled up to three times and suffered finally a surcharge of about 30 soles, or, under normal conditions, about twelve dollars in United States currency, a ton before arriving at the hands of the importers. Not only was this unreasonable surcharge paid by the Peruvian people out of their own pockets on all goods imported, but in addition the native industrialist with goods to export was seriously handicapped. Let us think of foreign export copper at seven cents a pound and we find that the harbor charges amounting to over ½ cent a pound are 7.5 per cent of the total value. The port of Callao is called upon to handle annually between six and seven hundred thousand tons of cargo. Of this the export constitutes about 25 per cent and the import about 75 per cent. Connected by eight steamship lines to Europe and five to the United States, Callao has an average of 22 calls of overseas ships per month. None of these were able to use the old French docks.

German, French and English engineers had offered plans for the new docks, but none of these had met with the approval of the government. It was not until the government under President Augusto Leguia in 1927 approached the Frederick Snare Corporation, contracting engineers of New York City, that acceptable plans



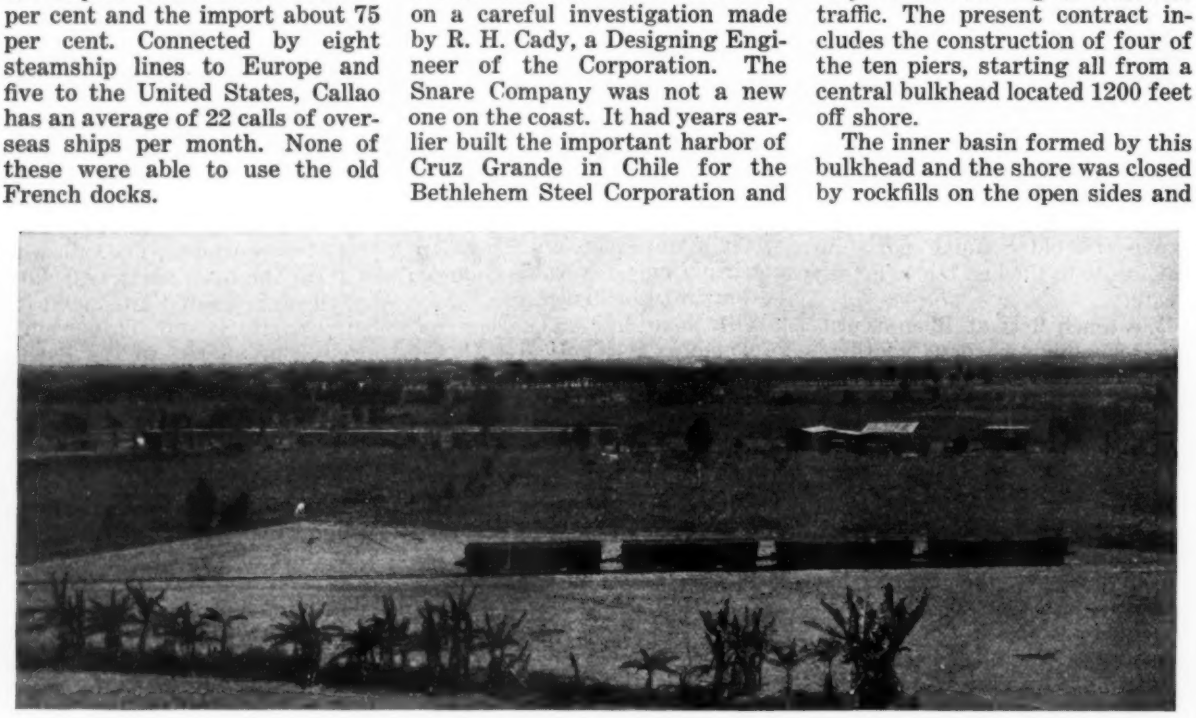
The beginning and the end. Above: Loading out the first carload from quarry hill. Below: One of the last cars loaded.

were submitted. These were based on a careful investigation made by R. H. Cady, a Designing Engineer of the Corporation. The Snare Company was not a new one on the coast. It had years earlier built the important harbor of Cruz Grande in Chile for the Bethlehem Steel Corporation and had built up a fine reputation throughout Latin America over a period of many years by its successful design and construction of port works and other engineering projects, particularly in the Island of Cuba.

Many advantages offered by accepted plans

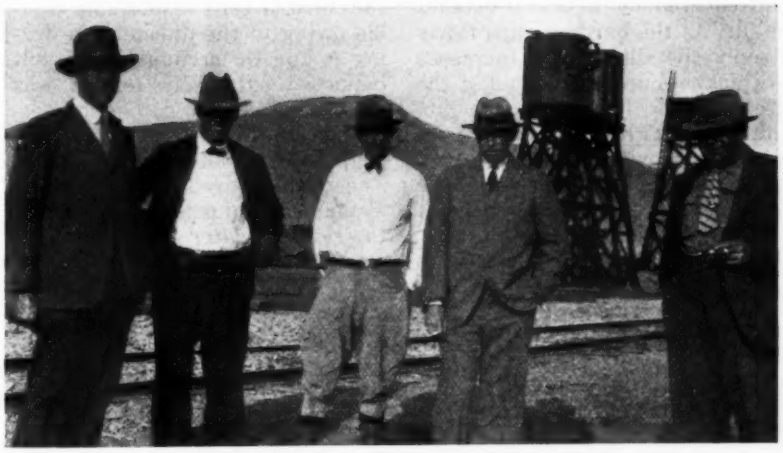
The plan offered by this company to solve the problem confronting them, which also formed the basis of the contract that was signed with the Peruvian Government, in March 1928, is remarkable in its simplicity of design and astounding in the possibilities it offers for a complete concentration of dock-authorities and customs organization under one roof, so to speak. It is surely the most appropriately designed and well executed harbor job on the South American continent. By the help of two great breakwaters, in all about 3 miles of heavy rockwall, a harbor basin of approximately one and a half square mile of quiet water is formed. This basin, that without being crowded, will permit room for the construction of 10 great modern piers side by side, also encloses the old docks. These are now ideally protected and will serve admirably in the handling of coastwise traffic. The present contract includes the construction of four of the ten piers, starting all from a central bulkhead located 1200 feet off shore.

The inner basin formed by this bulkhead and the shore was closed by rockfills on the open sides and



This wonderful panorama was taken from the quarry hill. Power house, machine shop, warehouse be seen San Lorenzo Island, while on the horizon just to

filled to ten feet above mean low water level with two million cubic yards of dredging material from the channels and the harbor basin. Approximately 30 acres of new land was thus formed. The expense of condemning costly water front properties was thereby avoided. Anyone who is a bit familiar with old overcrowded ports will readily realize the enormous value of such a provision for the further consolidation of a new port, giving clear place for rail approaches, switch-yards, warehouses, administration buildings and so forth. And by further construction along this ingenious plan corresponding new territory will be available.



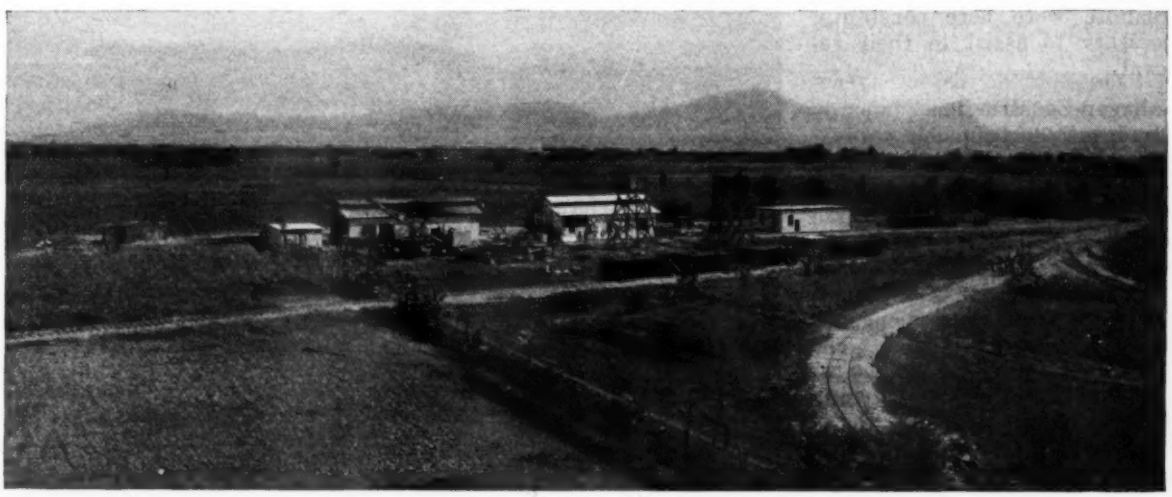
Some of the men responsible for the efficient quarrying operations—F. C. Watson, master mechanic; W. J. Coleman, general superintendent; S. A. Wee, mining engineer (the author); Mr. McHardy, a visitor; and F. L. Donner, in charge of shovels.

Of the four new piers, all six hundred feet long, two are full concrete decked open piers of one hundred foot width, and designed for handling bulk cargo, such as the importation of wheat, lumber and coal and the export of copper bars, concentrates, cotton, and so forth. With the extremely dry climate, where hardly any precipitation of water occurs this is possible. The two center piers are 286 feet wide of the filled type with an outer concrete deck of fifty foot width and a central fill of rock and heavy dredged material. On this fill on each pier are erected two warehouses of 540 foot length and 90 foot width of steel construction with corrugated steel and reinforced concrete walls, and corrugated asbestos roofing. The size of these warehouses will leave generous space for storing of all kinds of goods and the warehouses will therefore in themselves replace the old customs houses and act as such. The customs administration and dock officials will all be located in a spacious building erected on the shore fill behind the two central piers. The handsome saving in handling the cargo is apparent and will allow for a cut in landing charges of approximately 50 per cent—even after the government has levied a special tax of eighty cents a ton on all cargo to finance and amortizate this project.

Some 5,000 precast concrete piles used for docks

The concrete decks are all built on concrete piles, driven down by powerful steam hammers. To help them penetrate to hardpan water-jets were used, shooting down a stream of water at 200 pounds pressure alongside the piles. All piles, a total of almost five thousand, were precast on shore and of a special design developed by the company and used for many years. The decks were designed to stand a loading of 1,000 pounds per square foot and specially reinforced to support four railroad lines on each pier.

The main channel leading from the 600-foot wide opening in the breakwaters, and the turning basin, together with the central slip, were dredged down to 37 feet below mean low water, while the other berths were dug to 32 feet. The bottom of the bay of Callao consists of a layer of hard-



and water and oil tanks are in the right foreground. In the distance across the Bay of Callao can right of center ships at anchor are faintly discernable.

pan covered by a heavy blanket of silt. As the hardpan dips fairly steeply the silt blanket increases in thickness and at the end of the breakwaters has an aggregate thickness of 70 feet, being here intermixed with layers of hard packed sand. Into this silt there had, in the course of history, settled a surprising number of ships. Some of these were battered to pieces by the "Bravezas," others sunk by the attacks of the Bucaneers on the old Spanish fortifications and still others were the result of the last war on the Pacific. The monitor Manco Capac, brother of the hero of the United States Civil War, lay among them covered with mud. For the dredge this great number of derelicts meant loss of time. Divers and dynamite were here constantly necessary to assist in their removal.

Bringing it down. Behind the 100-B in the background are the "fleecy clouds" of a big blast.

Gahagan Construction Company dredges 2,200,000 cubic yards

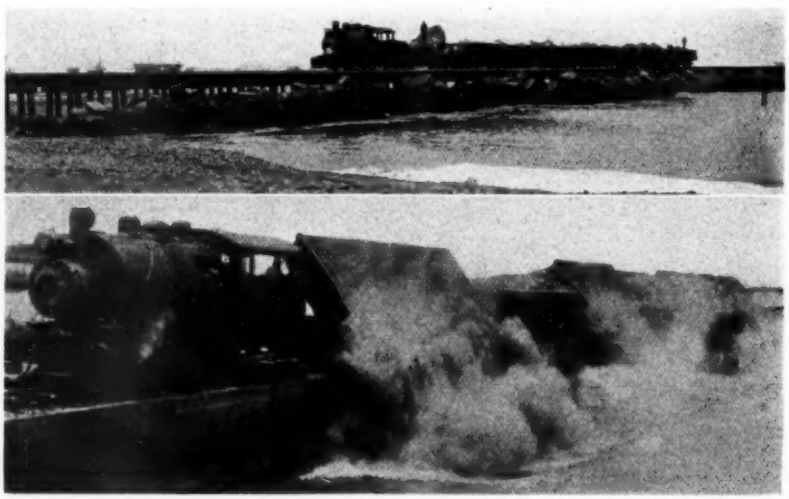
All the dredging was sublet to the Gahagan Construction Company of Brooklyn. Mr. Gahagan preferred to design and build a special seagoing dredge in New York and later, fully equipped and with spuds laid alongside, this was towed to Callao. The pump on this dredge had a capacity of 20,000 gallons per minute and, before it finally turned its nose homeward, sent more than 2,200,000 cubic yards of silt into the fills of the piers and inner basin. This hydraulic fill gave the constructor considerable trouble owing to the difficulty in drying it up. On account of the silt being so extremely fine it was practically kept in a colloidal suspension in the water, like a heavy soup that would thicken only to a certain degree of saturation. Usual physical or chemical means to free the water failed to work. The problem was at last solved by dragging rollers of two or three feet in diameter over the surface. The water of the topmost layer would squeeze out and dry in the strong sun or slowly drain away. By repeating this operation there eventually was formed a thick crust, good enough to support a man so trenches could be dug. These cut up the fill in small squares that eventually would dry. In this way we at last freed the water, but the fill then had taken on a resemblance like an intricate system of war trenches.

Three miles of breakwater most serious problem of entire job

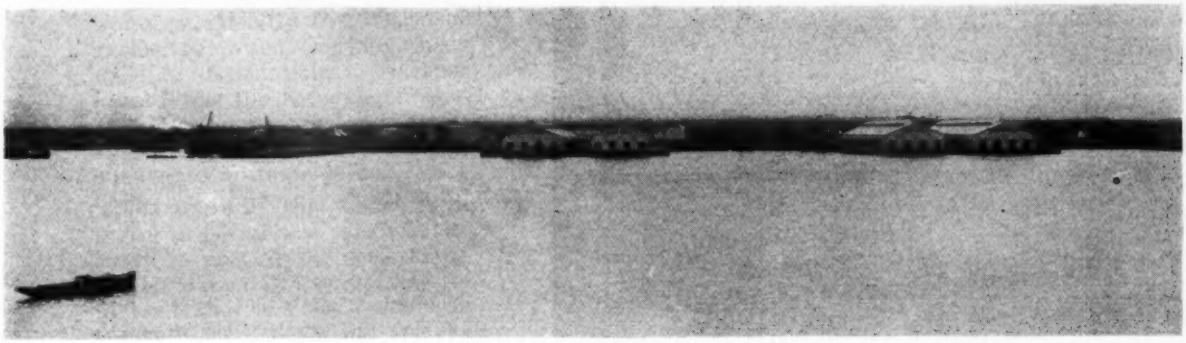
The most serious problem on the whole job confronting Frederick Snare Corporation was surely that of the construction of the breakwaters. These are of the same type as those of Colon at the entrance to the Panama Canal which had stood up so magnificently against the heavy Caribbean seas. Likewise they are built of dumped rock with the difference that those at Callao were top dressed with heavy blocks of from 15 to 25 tons weight. These huge submarine barriers of dumped mixed rock with sides probably sloping at one to two will arrest practically any wave that is formed and break up its power while the rest of it shoots over the top. The old system of breakwaters that one sees in European ports, consisting of a solid, smooth wall rising high enough above sea level to catch the last spray of the waves, were deemed unnecessary and impractical.

120-foot piling in trestles

It was decided to build the breakwaters from a trestle using 30-yard side dump cars for hauling the rock. Inshore bents of only four piles were used; further out a five and six pile bent was deemed necessary. On account of



Above: Trainload of rock going out on the north breakwater. Below: Placing backfill in Pier No. 2.



The new warehouses. Note the quietness of the harbor basin.

the enormous layer of silt that had accumulated to a thickness of 70 feet at the end of the breakwaters, piles of a total length of 120 feet were used. This was accomplished by splicing 70 foot piles. The trestles were advanced very rapidly. Pile bents were spaced on 12 foot centers and driven by a piledriver rig mounted on a flat car. It was in this way possible to move the rig around to repair broken down trestles and so forth, a plan that proved very beneficial.

Silt and sand layers cause serious difficulties

On account of the silt being intermixed with strata of hard packed sand the dumped rock would settle nicely into the loose silt until it hit the first layer of sand where it would be arrested and start to pile up, usually to ten feet below water surface, when the weight would become great enough to allow the rock to break through this first layer and sink to the next. This operation would be repeated regularly three times and caused considerable delay and often the settlement would be accompanied by a lateral movement which broke the piles and caused the whole trestle to sink. It was then necessary to perform the remarkable feat of penetrating with new piles the dumped fill and construct new bents to repair the trestles. It is readily realized that this unusual procedure required extreme care and close inspection in dumping operations, particularly in view of the fact that in order to minimize interference with the operation of the old port, the south breakwater was built entirely during night hours. That the company in this way placed more than a million and a quarter cubic yards of rock in the record time of 26 months without a single loss of life or any serious damage to its equipment, goes to prove the high efficiency of its staff. In the dumping operations the general line up was to dump as far out as possible right next to the pile drivers so that in case of settlement and damage to the trestle the pile-driver could be put on repairs and meanwhile permit continuation of dumping inshore.

Good equipment and plenty of it a Snare policy

When the Snare Corporation was confronted with the task of

Giving one of the 100-B's the "once-over" after completing the task.

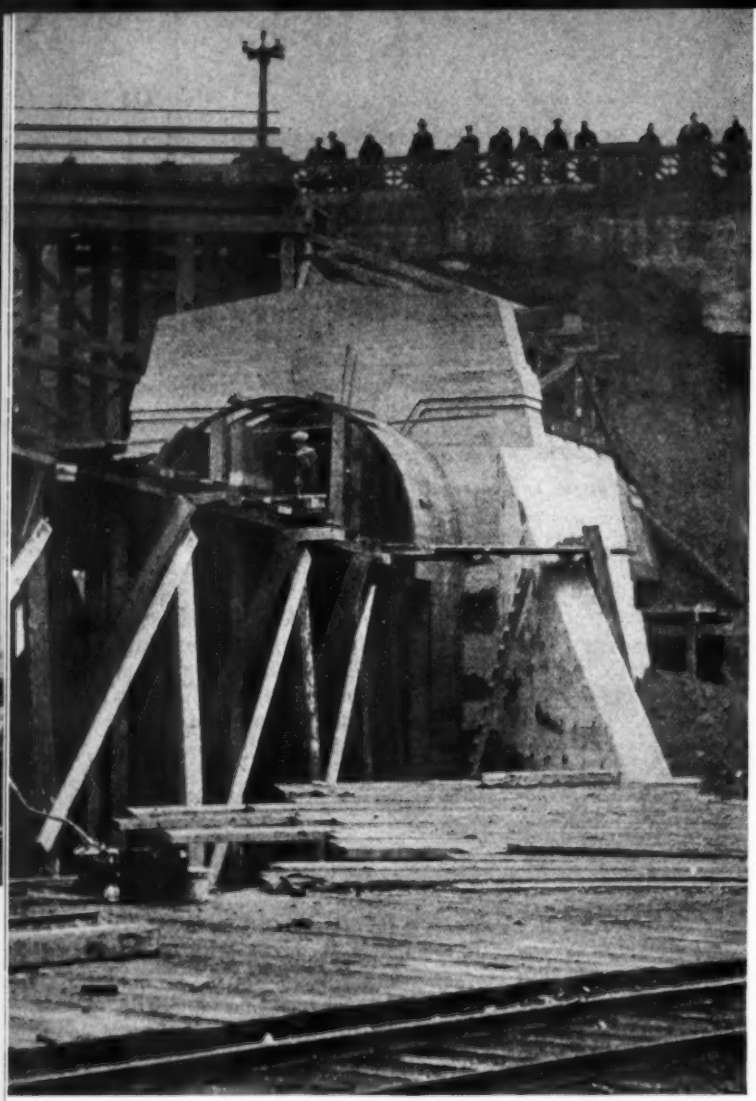
building the new docks they thought it wise to establish a complete construction unit on the coast under Vice-President G. P. Seeley's competent command. Only the best of tools and machinery was considered good enough and a full line of equipment was acquired making the job an absolutely independent and self-sustaining unit. This proved an excellent plan as, in the opinion of the writer, too often a contractor fails to invest enough in an original plant outfit, but will later make greater disbursements than required for adequate initial equipment when he has to pay for his over economy by forced delays caused by insufficient planning and shortage of working units. This practice makes itself much more felt in South American fields where one operates thousands of miles away from most equipment factories. But it does not happen on Frederick Snare Corporation jobs.

Especially well equipped was the quarry section that was located about five miles away from the harbor at a lone hill to the north. And there is no doubt but that this materially added to the efficiency of the quarry and contributed in no small measure to the high output at low cost that was recorded on this job. Not only did this forethought apply to equipment but, also to housing of employees which was taken care of by building commodious and comfortable quarters.

The auxiliary quarry equipment included the following:

1. A compressor and lighting plant in which were set up two Ingersoll-Rand compressors, two stage connected to 110 HP Diesel engines, and an Anderson semi-Diesel Oil Engine connected to a 40 KW Generator.

(Continued on page 134)



East portal of the C.P.R. tunnel at Vancouver as the boring commenced in February, 1931.

Holing through 6,140 feet of Tunnel under Vancouver, B. C.

THE TUNNEL under the heart of the city of Vancouver, connecting the main yards of the Canadian Pacific Railway with the sidings on False Creek has now been completed. Actual holing through of the tunnel was done on March 22nd when the final round was blasted. Since then work has been under way on the laying of ballast and rails and now trains are operating through the tunnel and the old level crossing in the heart of downtown Vancouver has been abandoned.

The boring of this tunnel underneath the city was a problem of interest to hard rock and tunnel specialists in all parts of Canada, and much interest was also shown in the project by engineers in the United States, a number of

Northern Construction Company and J. W. Stewart put new C. P. R. tunnel through heart of Canadian City.

by F. H. FULLERTON

inquiries for information on various points being received from widely scattered sources by the contractors and also by the railroad engineers.

The new tunnel runs for 6,140 feet under the business section of Vancouver. It is 22 feet 6 inches in height, 16 feet wide on the tangents, and 19 feet on curves. The rails are 100-pound steel and are laid on rock ballast. Construction of the tunnel was under the direction of Thomas Martin of the C. P. R. engineering department, who is an engineer experienced in tunnel work and who personally supervised the west end of the famous Connaught Tunnel in the Canadian Rockies.

Unusual hazards met successfully

Many unusual hazards were associated with the boring of this tunnel, running as it did underneath downtown Vancouver. Despite the difficulties, the work was accomplished with no more handicaps than are usually encountered in pushing a railroad grade through a mountainside, the only difference, according to engineers, being the fact that more time had to be spent on their end of the

work, particularly in the use of explosives when working near building foundations. Another hazard was the network of sewers and gas mains in the immediate vicinity of the tunnel at various stages in its progress.

The route of the tunnel from portal to portal was carefully selected to provide the easiest and safest course. The tunnel has its east entrance on False Creek near the railroad sidings and freight yards of the C. P. R. From there it swings under a recreation park, skirts the grounds of the Armory, and straightens out to follow Dunsmuir Street in a westerly direction through the heart of the city. At the corner of Dunsmuir and Richards it passes close to the deeply sunk foundations of the Holy Rosary Cathedral.

Lining poured in 50-foot movable form

The concrete lining of the tunnel was poured monolithically. In pouring, a 50-foot movable form on wheels was set up and the concrete from the mixer was forced through a Webb-type gun, air operated, through discharge pipes into the top of the form. The concrete was allowed to set for thirty hours before the form was advanced.

Although the tunnel was close to many sewers and underground mains, skillful locating by the engineering staff made it possible to use dynamite at all times, except in a few cases when some light charges of blasting powder were used. At one point where the arch of the tunnel came within six inches of a large city sewer, a special problem was encountered. This sewer, however, had been laid by the city after the tunnel construction had been definitely announced, and consequently provision was made at the time for the construction of the tunnel underneath it. A heavy reinforced concrete mat beneath this sewer withstood successfully the blasting in connection with the tunnel work.

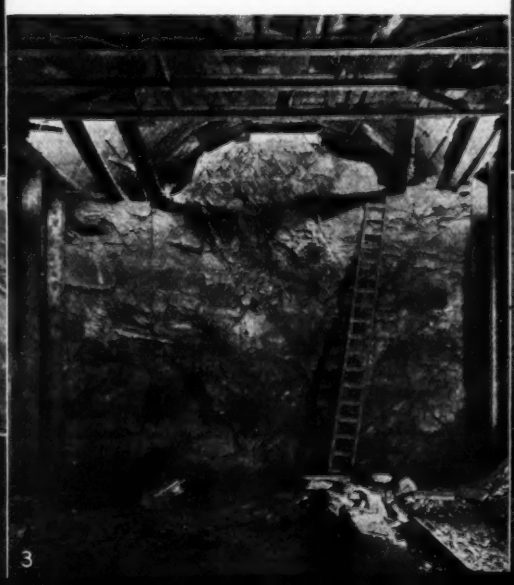
Despite the difficulties, the construction was carried out quietly and practically unknown to the occupants of the blocks overhead. There were no accidents of any kind and work was kept well up to schedule.

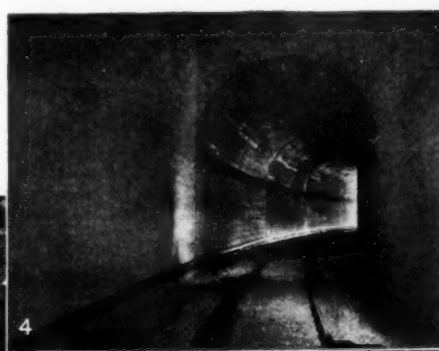
Mucking done with Bucyrus-Erie air-operated tunnel shovel

The mucking in the tunnel was done by a short boom, air-operated shovel. This was a Bucyrus-Erie B-3, full-revolving tunnel shovel—13½ foot boom—one cubic yard dipper — on caterpillar type mounting—and using 450 cubic feet of free air per minute in operation. The excavated material was carried away on a narrow gauge railway powered by 6-ton Jeffery Manufacturing Company electric battery locomotives hauling 2-yard Ross & Howard Iron Works cars. Usual drilling methods for blasting were not necessary as the rock (sandstone and shale) was soft enough to use augers. These were Chicago Pneumatic, Sullivan, Helmsn and Canadian Ingersoll-Rand power augers operated by air. Canadian Ingersoll-Rand RS 3 — 1100 feet and Sullivan WJ 3—800 feet compressors were used.

The project was handled by the Northern Construction Company and J. W. Stewart. N. D. Lambert was the engineer in charge of the work for that company, working under the general direction of Mr. Martin. W. B. Young, assistant city engineer of Vancouver, also officiated in a supervisory capacity.

1. Bucyrus-Erie B-3 air-operated tunnel shovel used for mucking. This machine has a 13½-foot boom, carries a 1-yard dipper, and is full-revolving. 2. Looking into the heading. Note slip scraper and hoist on platform used for mucking out the heading. Plank runways connect this platform with the heading. 3. This rock formation was very soft and auger power drills were used. 4. The completed tunnel ready to carry trains under downtown Vancouver. 5. The machine at the left forced concrete up through the 6-inch inclined pipe into the movable forms in the background. The large ventilating pipe was carried right through the form bracing.





EXCAVATING ENGINEER

A Monthly Publication Devoted to Excavating and Allied Subjects

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The Business Situation

IF WE take the average of years from 1910 to 1914 and, arbitrarily, establish that as a base for a chart of business activity, we find that, during the present depression, business activity reached its lowest ebb in July, 1932 at a point approximately 47 per cent below normal. In the six months that have just passed, business has recovered so that today it stands at 40 per cent below normal and the recovery has been almost steady over the past six months. Surely a recovery of this magnitude—more than one-seventh of the ground lost—does not warrant the pessimism that we still find among certain business men. There is no short cut to prosperity, it must come gradually and as the result of the restoration of confidence.

Last Fall both political parties presented, as the economic part of their platforms, a series of very sound promises which, if fulfilled by the coming administration, will add momentum to the improvement now under way. We refer particularly to the following:

1. A thorough reduction of governmental expenditures.
2. A balanced budget.
3. A sound currency.
4. Reciprocal tariff agreements.

Perhaps the most dangerous thing on the horizon at the moment, is the number of bills presented to Congress for the deflation of the value of our currency. It seems odd that with so many historic examples of serious difficulty brought on by fiat money any country composed of supposedly sane-thinking individuals should seriously consider measures, the object of which would be to decrease the value of our money. The most striking objection to all the measures so far proposed is that, even if the objective was attainable, the amounts of currency involved are so small as to be absolutely inadequate to do more than destroy confidence in our system. The business of this country is carried on with credit—not with currency.

The currency in use in this country is approximately the same as that in use in the years 1918 to 1922. Bank credit today is about equal to the bank credit of those years but the latter is almost ten times the former. In other words there is ten times as much credit used in our business dealings as there is currency. Increasing the volume of credit available would probably increase business activity, but it is certain that fiat money would not help attain this end.

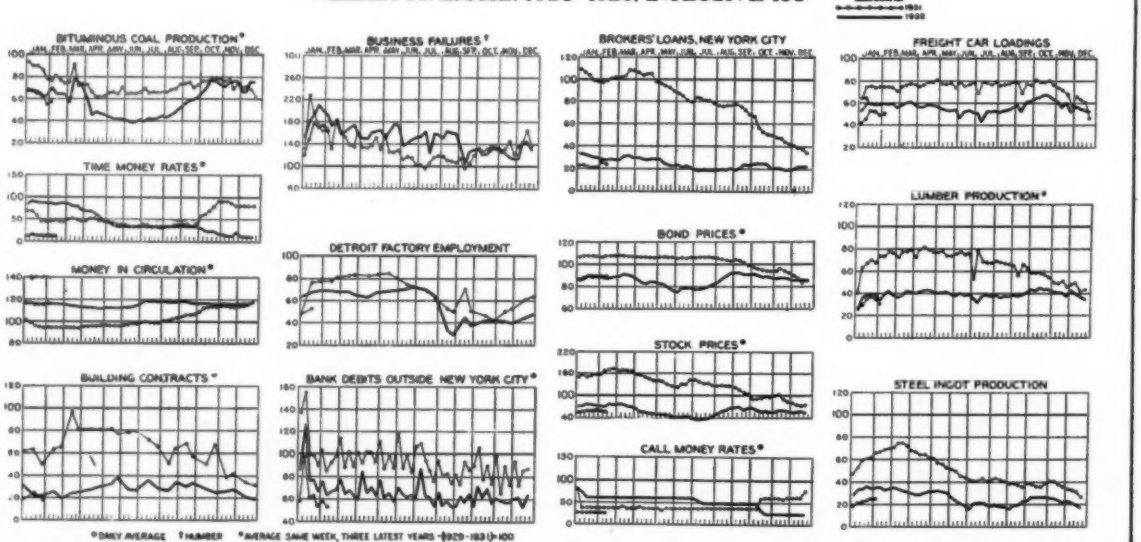
Decreases in the value of the dollar ordinarily brought about involuntarily through factors over which the Nation has had little or no control, have always wrought havoc with the welfare of the Nation—rewarding speculation and penalizing thrift. The present, when every sound, constructive help toward better times is necessary, is no time for voluntary experiment with debasement of our currency.

The Cleveland Trust Company in their bulletin dated February 15, 1933 have summarized a very good discussion of this matter as follows:

"1. So long as we keep our paper money redeemable in gold on the present basis we cannot print and circulate enough additional currency to cause any con-

WEEKLY BUSINESS INDICATORS

WEEKLY AVERAGE, 1923-1925, INCLUSIVE=100



siderable increase in our general price levels.

"2. We do most of our business with checks and not with currency. About nine-tenths of our money is bank deposits on which we draw checks, and only about one-tenth is currency. To restore purchasing power and lift prices we need to expand our bank credit which has greatly decreased during the depression, and we do not need to increase the currency of which we now have more than when the depression began.

"3. As long as we retain our present money redeemable in gold we cannot raise our price levels through increasing our supply of money unless we can also succeed in raising the price levels of the rest of the world, for gold prices of staple commodities freely entering into international trade are world prices, and in the long run control general price levels.

"4. We cannot decrease by law the gold content of the dollar, for the attempt to do so would involve long debate in the Congress during which people would attempt to convert their present money into gold in the hope that Congress would convert their gold into an increased number of dollars. The resulting gold run would carry us off the gold basis.

"5. The Supreme Court has declared that contracts promising to pay in dollars equivalent to gold dollars of the present weight and fineness are valid whether our money is on the gold basis or not. Our federal bonds, nearly all our state and municipal bonds, and most of our corporate bonds, are contracts to pay carrying that sort of gold payment provision.

"6. If the gold content of the dollar could be reduced its effect in raising domestic price levels would probably be disappointingly gradual.

"7. A moderate controlled currency inflation based on present gold standards would not raise prices. A currency inflation sufficient to raise prices would carry us off gold and become uncontrollable."

Old Times & Old Timers

THE ACCOMPANYING picture is furnished us through the courtesy of Henry C. Inch an Old Timer from Hurley, Wisconsin. Mr. Inch, who is shown at the left, was the "boom cat" on this "old relic," as he calls it, when this picture was taken back in 1910. A description of its operation follows:

"This old steam shovel was used for stockpile work at Iron Belt, Wisconsin. It had to be cribbed up four feet with ties and planks in order to reach the top of the ore cars.

"I cannot say what make it was, as there was no shop number or name plate on it. We called

it the 'Old 49.' It had a Bay City Hoist with a cone friction; when the friction became hot from constant digging it would emit a loud 'squealing' noise.

"The upright boiler carried 85 pounds of steam so you can imagine the power it had. The craner could stall the hoist any time he wished by crowding a little extra with the boom engine.

"The craner sat to the right on the circle and on going to the extreme right he had to duck his head under the brace to avoid an unpleasant bump. It had a 1½ yard dipper.

"Note the hoisting chain running overhead, all the dirt is gathered while digging was shaken off on the "boom cat."

Thank you, Old Timer Inch.

Come on Old Timers!

Cash for your yarns and pictures!

EACH month we will run in this section anecdotes, adventures and interesting data regarding old times and old timers. The makings must come from you. Send along your pictures and letters . . . facts and pictures that made excavating history. Here are a few questions we've been asked. Help us answer them.

1. Back in the old days Mathews Bros. of Erie, Illinois, owned a Cross back-digger which operated in both Whiteside County, Illinois and in several towns in Iowa—Lake Park, Spirit Lake, Fonda, Algona, Superior, Pocahontas, Sibley, Spencer, Wooden and Titonka. Both Mr. Mathews and Ed Lovejoy operated this machine. If you know of any other men who operated this machine send us their names. If you know of any other men who also worked on the jobs at these towns, let us have the story.
2. Who has a copy of the old Cross Catalog? If you have one please tell us about it. If you did have one tell us when you received it.
3. It is some 25 years ago that George A. Castle of Crookston, Minnesota used a Fairbanks back-digger with a two line control on some work in Montana. If you saw this machine work or know of people who did, let us hear from you.
4. Can anyone give us information on the "Kelgore" shovel described by Old Timer J. F. Sullivan in Excavating Engineer January issue?
5. One of our Old Timers asks about the early tractor-shovels or tractor-cranes. Can you furnish a description or snapshot on any of these old timers? We understand some of these ancestors of modern equipment were weird contraptions but that some of them worked quite successfully nevertheless.

Remarkable Foreign Excavator Barred from U. S.

Law originated many decades ago permits unusual dirtmover to work only in foreign countries

DESCRIBED in a recent letter from Rhodesia is an excavator developed there and today found at work in all sections of that country. Very few of these dirt movers have found their way into foreign lands but, because of the remarkable efficiency and low cost with which they operate, American contractors will, no doubt, appreciate a brief outline of their specifications.

The unit differs in operation from most of our American excavators in that it combines the function of excavating material with that of transportation to the spoil pile or dump even where the spoil pile is at a considerable distance from the excavation.

The excavator is equipped with walking traction and has remarkable mobility. It is able to move and operate on extremely soft ground and its very unusual type of traction permits it to quickly side-step obstacles or to change direction quickly to move around large obstructions. This most effective walking arrangement, which has both speed and mobility, is largely responsible for its successful operation both on the surface and underground. Of particular interest to contractors engaged in basement excavation is the ability of this machine to easily climb grades of even more than 50 percent.

Spoil pile behind this unusually efficient Rhodesian excavator.

The overall efficiency is unusually high and both the digging motions and propulsion are carried on with no noise and without smoke or soot. The actual speeds of the machine are not great but since each load of dirt may more than equal the weight of the excavator, the volume moved is quite remarkable for the size and weight of the machine. It is particularly efficient in tunnel operation.

The design is very unique since the machinery is entirely inclosed and no rotating parts are exposed. The entire mechanism is lubricated by products formed from the consumption of fuel. Records show the operating cost in many cases to be practically zero since the fuel consumed is almost entirely waste vegetable and animal matter found in Northern Rhodesia. Wood of all kinds has been found most acceptable for fuel but the machine has thus far not been adapted to fuel oil, coal or electricity.

Careful study of this excavator convinced General Manager David Irwin of the Roan Antelope Copper Mines in northern Rhodesia, that it would arouse considerable interest and attract great attention if imported to the United States. After advising a friend in the shovel business of the remarkable qualities of this earth mover, he attempted to make arrangements to ship one to United States but was met with the flat refusal of the authorities to allow its entry.

Further investigation disclosed a law of long standing which would prohibit the importation of any working model of this excavator—ordinarily known as the Rhodesian White Ant.

Since it may seem somewhat unfair to have referred to our insect friend as "it," let us point out that, barring the queen ant and some of her more intimate friends, there seems to be some uncertainty about gender.

Production of Electricity in 1931

THE TOTAL amount of electricity produced for public use in the United States in 1931 was 91,729,000,000 kilowatt-hours. Of this amount 67 per cent was produced by the use of fuels and the remainder by the use of water power.

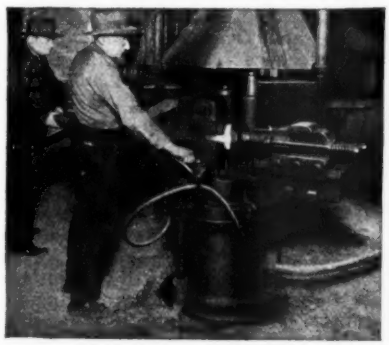
The amount produced by fuels was 61,124,000,000 kilowatt-hours, and the fuel consumed in generating this amount of electricity was as follows: Coal, 38,717,000 tons; fuel oil, 8,114,000 barrels; gas, 139,350,000,000 cubic feet; and wood equivalent to about 270,000 tons of coal.

EQUIPMENT
You Ought to Know About

Sharpener for Well Drill Bits

The new WD well-drill bit sharpener has been recently announced by *Ingersoll-Rand Company, 11 Broadway, New York.* According to the manufacturer, its bits will effect a saving of from 50% to 61% in drilling costs and that these bits can be produced at a saving of 50 per cent in sharpening costs. New bits can be forged on blank steels in two or three heats, and dull bits can be redressed in one heat.

The WD sharpener is claimed to make perfectly formed bits



which are concentric with the steel and accurate in gauge and in other details. Thus an appreciable reduction is made possible in the number of stuck bits and crooked holes. Because of this, and because of the greater footage drilled with WD sharpened bits and the rapidity with which they can be resharpened, fewer steels per drill are required. The fact that bits can be made from blanks results in an additional saving in the purchase price of steel.

For complete information write the manufacturer, mentioning this magazine.

Largest Electrically Welded Ship to Load and Unload Stone in Quick Time

A NEW TYPE of boat is being built according to the specifications of *John H. Odenbach, President and General Manager* of the *Dolomite Products Company* of Rochester, New York will be of interest to many of our readers. This is said to be the largest electrically welded ship yet attempted in this country. The design presents many unusual features which makes it especially suitable to serve the Dolomite Company in the Great Lakes and in the New York State Barge Canal.

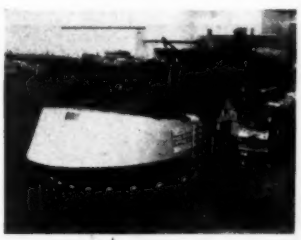
The construction involves the use of a skeleton of channel shapes with longitudinal kelsons and horizontal deck channels. All joining is done by welding. Instead of the usual hull plating a complete bow and stern structure and complete intermediate sections are built up and joined until the whole hull is developed. The ship now under construction is 212 feet long, 32 feet wide and has a depth of 13 ft. 4 inches. It is expected to have a net tonnage of 400 and a gross tonnage of 1600 tons at a draft of 9 feet 6 inches. 28 separate ballast tanks give a capacity of 600 tons of liquid. These ballast tanks are controlled from the pilot house by compressed air and permit accurate and rapid control of the various drafts to facilitate passing under bridges and to permit varying the free board for convenient loading and unloading at ports. All deck openings, pilot house and cabins are made watertight to prevent entrance of water from waves when operating in rough water. 14 self cleaning cargo bins give a bin capacity of 1200 tons of material. These cargo bins are designated to carry bulk material such as cement, sand, stone, gypsum, iron ore, coal, coke, grains and chemical products and are arranged so that liquid cargo such as oil may also be handled. The bins are self trimming and the cargo handling gear has a capacity sufficient to load a full cargo of stone or other products in one hour and to unload shipments to stock piles, bins or warehouses in approximately three hours.

The propelling equipment consists of two Diesel engines of 400 b.h.p. each, direct reversible and controlled from the pilot house. Speed is expected to be 12 to 14 miles per hour. Double rudders will be controlled by electro-hydraulic steering gear. The most advanced process of shielded-arc electric welding is used in assembling the hull. By the use of welding some 300 to 400 tons of weight will be cut from the weight required for standard construction.

Scraper for Digging Hard Soil

DEVELOPED for digging behind a tractor in hard soil, the new "Crescent" hydraulic scraper has recently been put on the market by *Sauerman Bros., Inc., 474 South Clinton Street, Chicago.* The curved design affords the wearing blade a continuous plowshare action, enabling the bucket to dig its load without previous plowing or other preparation. The construction of the bucket is said to automatically regulate the depth of its cut, varying with the hardness of the soil, and reducing the line pull needed to load the scraper. The scraper is dumped without stopping the tractor by transferring the pull from the bottom to the top of the bucket, using a hydraulic plunger actuated by a pump mounted on the hoist. This pump and control valve may be attached to any tractor, although many have this equipment.

The new "Crescent is claimed to have a tendency to limit its own cut, but there is a further control available to the operator, the hydraulic control which will limit the depth of digging. This control will also permit the operator to regulate the depth of the dump, permitting dumping in a single place or spreading to any desired depth. The tractor com-



monly moves forward at uniform speed without stopping for the dump, but can be backed if desired. The scraper will move over any ground that the tractor will travel.

The construction has been made as simple as possible. It has no latches or catches, no wheels or journal bearings. All wearing parts are simply made and are easily replaced. For additional data write Sauerman Bros., mentioning this magazine.

SHOTS *from the Firing Line*

$1,598,000 New Construction Loans Approved by R. F. C.

THE Reconstruction Finance Corporation on January 28th approved loans totaling $1,598,000, the largest single loan being one of $1,300,000 to the Orleans Levee District of New Orleans for flood construction work and airport construction. Glen Rose, Texas, receives $45,000 for financing a new waterworks and sanitary sewer system; Greenville, Mississippi,—$175,000 for completion of a river freight terminal; Vernal City, Utah,—$38,000 for rehabilitation of the cities water system; Cambridge, Ohio,—$25,000 for sanitary sewer; Long Pine, Nebraska,—$15,000 for extension of its water supply system.

Applications still to be acted on by the R. F. C. include $610,000 for the construction of a toll bridge and causeway connecting Cape Lookout with the mainland at Lenoxville Point by the Cape Lookout Highway, Inc., Beaufort, N. C.; $500,000 to the city of Galveston, Texas for port work and wharf improvements; $400,000 for 130 miles of pipe line to bring natural gas to the city of Abilene, Texas; $400,000 to consolidate the public plants of the San Benito, Harlingen, Santa Maria and La Feria Irrigation Districts of Texas into one pumping plant on the Rio Grande to supply water to 120,000 acres in the district; $2,000,000 to the Brownsville Navigation District for dredging the inner channel and turning basin, terminal facilities, right of way, railway connection and general expenses (Federal Government is dredging the outer channel and constructing jetties at an estimated cost of $2,158,000); $300,000 for a sewage disposal plant at Bloomington, Indiana; $3,500,000 for construction of the Red Bluff dam at the Pecos River in New Mexico for irrigation of Pecos Valley; (bids for this called in anticipation of approval will be received February 25th by the Red Bluff Water Improvement District).

Continuance of Road Construction Profitable for Car Owners

THE NETWORK of improved roads which covers America has resulted in a huge saving to motorists. In this saving the car owner receives a return on the special levies—gasoline taxes and license fees—which he pays into the road funds of the various states, Floris Nagelvoort, of Seattle, President of the National Automobile Dealers' Association, pointed out recently.

"If construction of new roads is stopped and maintenance of pavement already built is neglected through withdrawal of Federal Aid or the diversion of state motor funds, the motorist will lose the benefit for which he has already paid and will get nothing for the money he pays in future months," declared Mr. Nagelvoort. "The motorist through gasoline taxes and license fees, has been paying practically all the cost of state roads.

"The benefit received by the car owner is shown in various studies of operation of passenger automobiles and motor trucks over different kinds of pavement and under varying conditions. The Engineering experiment station of Iowa State College recently compiled the following table on cost of operation of the "average" automobile in cents per mile:

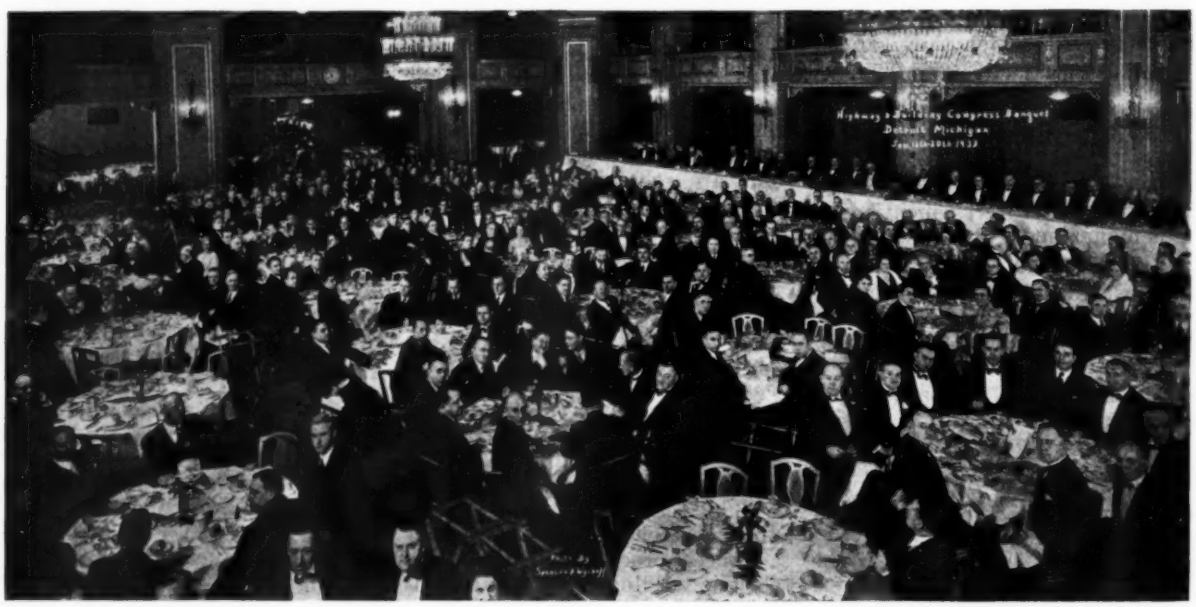
	High Type Roads	Intermediate	Low Type Roads
Gasoline	1.09	1.31	1.61
Oil	0.22	0.22	0.22
Tires and Tubes	0.29	0.64	0.84
Maintenance	1.43	1.72	2.11
Depreciation	1.26	1.39	1.57
	4.29	5.28	6.35

"To the above totals were added 1.15 cents per mile for license fees, garage, interest and insurance, making the total for the high type road 5.44 cents per mile to 6.43 for intermediate and 7.50 for low type.

"When roads are allowed to deteriorate through the lack of proper maintenance, costs of operation rise rapidly.

"Motorists everywhere should see to it that they receive the service in highway extensions and upkeep for which they pay their gasoline taxes and license fees."

Highway and Building Congress Banquet, Masonic Temple, Detroit, January 19th



$75,000,000 San Francisco-Oakland Bridge to Start Soon

UNANIMOUS approval of six bills by the California Legislature clears the way for the $62,000,000 loan already approved by the R. F. C. Immediate start on the $75,000,000 San Francisco-Oakland project is assured. The California Toll Bridge Authority will rush the start of the work as promptly as possible and bids for the five main west channel piers will be opened February 28th. Bids for other foundations and superstructure units will be called during March. This great bridge across San Francisco Bay will provide vehicular and interurban traffic between San Francisco and the cities across the bay. It will be publicly owned and will be self-liquidating through bridge tolls.

The total length is about 7½ miles and the bridge will span the five mile water barrier between San Francisco and the metropolitan area on the east side of the bay. There will be two 2310-ft. suspension spans in the west channel, a 500-ft. tunnel through Yerba Buena Island and a 1,400 ft. cantilever span across the east channel. The bids scheduled for opening on February 28th cover work estimated to cost $8,500,000. On March 2nd bids for 21 piers forming the eastern section of the bridge will be opened and present plans call for opening of bids on other sections of the main structure and the island tunnel before the middle of March.

More Equitable Basis for Mechanics' Lien Provided

A MORE equitable basis for liens against real property by laborers. persons who furnish materials, subcontractors engaged in building construction and related work and others is provided by the Uniform Mechanics' Lien Act just published by an Advisory Committee of the Department of Commerce, working in cooperation with the Division of Building and Housing of the Bureau of Standards. Completion of the Act by the committee which was appointed in 1925 by President Hoover, while he was Secretary of Commerce, marks a forward step in legislation of this kind, according to the committee's report to the Secretary of Commerce announced by the Department today.

The uniform Act provides for an informal procedure, which conforms largely to modern business practice in the construction industries, in order that the parties involved may adjust any difficulties that may arise without resort to the public record. A lien action is not a friendly act and its avoidance is advantageous to all parties through the saving of expense, delay and annoyance, the preserving of business reputation, and keeping titles clear of lien clouds.

Although legislation on this subject in the United States goes back to a Maryland act of 1791 which was enacted to encourage the building up of Washington, D. C., much of the legislation since that time has been the result of demands of particular groups in the construction industries which has resulted in advantages to such groups at the expense of others. Later, the positions would be reversed by further amendment to the acts.

Sand and Gravel Production 153½ Million Tons in 1931

THE TOTAL output of sand and gravel reported as sold or used by producers in the United States in 1931 according to a summary just released by the United States Bureau of Mines, amounted to 153,479,044 short tons, valued at $86,280,320, a decrease of 22 per cent in quantity and 25 per cent in value as compared with 1930. Production was reported for approximately 2,650 plants and pits in 1931 as compared with 2,700 in 1930.

There were decreases in all classes of sand and gravel materials except the sand used for miscellaneous purposes such as fills, bank-widening, etc. Glass sand decreased 9 per cent in quantity and 13 per cent in value, molding sand 36 per cent in quantity and 40 per cent in value. Building sand decreased 25 per cent in quantity and 28 per cent in value, and building gravel 24 per cent in quantity and 28 per cent in value. Paving sand showed a decrease of 24 per cent in quantity and 27 per cent in value and paving gravel 12 per cent in quantity and 18 per cent in value.

The total output of sand in 1931 amounted to 64,492,826 short tons, valued at $36,696,746, a decrease of 23 per cent in quantity and 26 per cent in value as compared with 1930. The total amount of gravel amounted to 88,986,218 short tons, valued at $49,583,574, a decrease of 22 per cent in quantity and 24 per cent in value from 1930.

Eleven states each reported the production of over 5,000,000 tons of sand and gravel in 1931 as compared with fourteen states in 1930. New York, Illinois and Indiana were the largest producers of these materials in 1931, New York reporting 17,155,174 short tons, Illinois 10,297,943 tons and Indiana 10,091,450 tons. California, Ohio, Pennsylvania, Michigan, Texas, Wisconsin, Massachusetts and Louisiana followed in order among those exceeding 5,000,000 tons each. The states leading in total value of output were New York with $10,612,014, Pennsylvania, $6,977,246 and California $6,222,779.

The total washed and screened or otherwise prepared sand and gravel sold or used by producers in 1931 amounted to 120,647,222 short tons, valued at $75,023,189 or 79 per cent of the total sand and gravel produced.

Coal Men to Meet at Pittsburgh

THE 10th Annual Convention of Practical Coal Operating Men and the National Exposition of Coal Mining Equipment, will be held at the William Penn Hotel, Pittsburgh, Pennsylvania from May 8th to 12th. This is the meeting of the Coal Division of the American Mining Congress. The meeting was originally scheduled for Cincinnati but was moved to Pittsburgh at the request of the members in the interest of economy.

Federal Funds Available for Highway Contracts as of February 1st

THE FOLLOWING summary prepared by the U. S. Bureau of Public Roads shows the amount of Federal Aid and Emergency Relief funds available to the various states as for February 1st. This is the balance of appropriated funds for the period which ends at midyear 1933. As we go to press Federal Aid for the two year period from July 1st, 1933 still waits for Congressional action.

State	Balance Federal Aid Funds for New Contracts	Balance Emergency Highway Funds Available for New Contracts	Total Federal Funds Available
Alabama	$3,315,399	$113,810	$3,429,209
Arizona	128,134	231,357	359,491
Arkansas	1,448,409	1,018,324	2,466,733
California	52,051	220,199	272,250
Colorado	805,465	1,095,043	1,900,508
Connecticut	17,881	3,116	20,997
Delaware	33,026	16,182	49,208
Florida	1,241,804	225,268	1,467,072
Georgia	84,697	47,699	132,396
Idaho	75,428	149,062	224,490
Illinois	126,899		126,899
Indiana	123,082	946,213	1,069,295
Iowa	11,498	92,983	104,481
Kansas	349,958	430,949	780,907
Kentucky	153,099	209,917	363,016
Louisiana	8,644	1,359	10,003
Maine	72,744	1,474	74,218
Maryland	32,060	305,663	337,723
Massachus'ts	30,738		30,738
Michigan	120,096	290,534	410,630
Minnesota	47,190	336,559	383,749
Mississippi	3,605,579	714,103	4,319,682
Missouri	307,560	1,221,615	1,529,175
Montana	195,372		195,372
Nebraska	298,699	250,671	549,370
Nevada	60,955	482,963	543,918
N. H'phshire	112,616	182,366	294,982
New Jersey	65,234		65,234
New Mexico	267,392	715,744	983,136
New York		15,000	15,000
No. Carolina	1,584,117	618,744	2,202,861
No. Dakota	222,493	64,502	286,995
Ohio	233,614	246,793	480,407
Oklahoma	434,169	602,397	1,036,566
Oregon	109,263	145,192	254,455
Pennsylvania	26,340		26,340
Rhode Island	24,932		24,932
So. Carolina			
So. Dakota	55,377	12,066	67,443
Tennessee	549,330		549,330
Texas		490,914	490,914
Utah	211,910	499,093	711,003
Vermont	16,038	146,814	162,852
Virginia	310,232	217,222	527,454
Washington	94,532	50,969	145,501
W. Virginia	194,007		194,007
Wisconsin	63,392	7,500	70,892
Wyoming	4,053	199,243	203,296
Hawaii	749,437	38,243	787,680
Totals	18,074,945	12,657,865	30,732,810

Argentina

Under the new National Highway Law, approved October 5, 1932, the planning of national and provincial highways is a function of the National Highway Bureau (appointed under that law) and the separate highway organizations which each province must set up to comply with the new law in order to obtain the federal aid provided for the Provinces. The entire operation of the new law is to be similar to that of the United States. Under the National Highway Law each province must enact legislation which will serve as an agreement or contract with the Federal

Government, and set up organizations in charge of provincial highway affairs, with their own regular sources of income.

From April 1, 1929 to March 31, 1930, the national highway expenditures were 14,265,979 pesos (about $6,000,000). From April 1, 1930 to December 31, 1930, these expenditures were 19,387,715 pesos (about $8,250,000) of which 16,913,717 pesos were from the general budget and 2,455,998 pesos from the Mitre Law (a gross earnings tax on privately-owned railways). During the calendar year 1931 the total spent by the national government was 19,294,225 pesos (approximately $8,200,000); of this total, 12,614,526 pesos were provided in the general budget, 3,337,530 pesos by the Mitre Law, and 3,342,170 pesos from the gasoline sur-charge. As the gasoline surcharges became effective February 4, 1931, the total amount collected (17,009,243 pesos) was in excess of the amount expended from that source. The difference was carried forward to 1932, to pay for work authorized during 1931 but not completed.

Definite figures for 1932 are not available as yet, but it is estimated that the total will about equal the 1931 figure. Under the new Highway Law it is estimated that 60,000,000 pesos ($25,500,000 at par) will be derived from the following sources: Budget, 10,000,000 pesos; gasoline tax, 45,000,000 pesos; and tax on lubricating oils, 5,000,000 pesos. There also will be additional revenue for the National Government from a tax on the increased valuation of land through which new roads are built, from fines and donations, and the proceeds of highway bonds which will be issued. These items will materially increase the amounts available for 1933 and future years. Definite figures are not available for expenditures by provinces. Under the new National Highway Law, 60 per cent of the revenue provided is to be allocated for the Federal Construction Highway Fund and 40 per cent as federal aid to the provincial and territorial highway funds. Federal aid is distributed among the various provinces partly in relation to population and partly in proportion to gasoline consumption. The bulk of all construction work is let by bids to private constructors. American companies have participated in street construction in various cities. Foreign companies participating in bidding for construction do so through subsidiary companies organized under Argentine laws.

Local deposits of sand, gravel and rock, suitable for road building purposes, are distant from the more densely populated areas and must be brought to points of use at high transportation costs. Large amounts are imported, mostly from Uruguay. Asphalt is produced locally but not in sufficient quantities to supply the demand. Exports of petroleum asphalt from the United States for 1929, 1930 and 1931 were as follows: 4,790, 2,452 and 2,142 tons, valued at $112,996, $57,003 and $44,974 respectively. Cement consumption is very high and although it is produced locally, some is imported. In 1929, 1930 and 1931 the exports of cement from the United States were 70,264, 55,620 and 36,886 barrels, valued at $408,744, $296,231 and $180,574 respectively.

Oregon

Supplementing the highway forecast in the January issue we present here the following information as to the present status of the Oregon State Highway program as furnished us through the courtesy of R. H. Baldock, State Highway Engineer and S. H. Probert, Office Engineer.

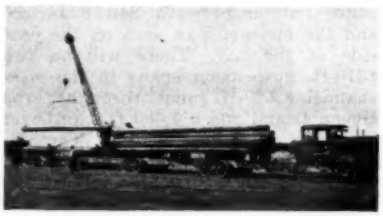
The Oregon State Legislature is still in session and has before it numerous bills effecting highway revenues so there is still considerable uncertainty as to the extent of the 1933 program particularly as the amount of Federal Aid has not yet been determined by Congress. However, on the basis of available funds Oregon will spend about $4,000,000 during 1933 all but about $2,000,000 of this amount on work under construction January 1st. Even if no additional funds are made available this will enable an increase of 15 per cent over the work carried on in 1932. Of this $4,000,000 approximately $800,000 comes from Federal Aid, $2,000,000 from Emergency Federal Relief funds, $900,000 from State Appropriations, $150,000 from Federal Lands Funds and $150,000 from County co-operation. About $1,000,000 will go into grading of 50 miles of new roads requiring 2,000,000 cubic yards of excavation. About $1,300,000 will go for grading, widening and reconstruction of 120 miles which will also require about 2,000,000 cubic yards of excavation. Surfacing with gravel or crushed stone is expected to cost $500,000 for 100 miles. Oil treatment of 100 miles will cost about $150,000. High type paving of 30 miles will cost some $600,000 and 30 miles of bituminous macadam will cost $150,000. There is about 3,000,000 cubic yards included in the work already under construction and this is to cost $1,500,000.

Olympia-Aberdeen Ship Canal Proposed

THE unemployment committee of the Washington State Legislature is considering plans for the construction of a ship canal from Olympia to Aberdeen to cost some $37,000,000 and give employment to 20,000 men for two years. It is claimed the canal will be self-liquidating from shipping tolls and that it would save steamers from Seattle to California 222 miles. The project provides for a canal 200 feet wide at the base, 300 feet at the water surface and 50 feet deep. Two plans of financing are under consideration either by state bond issue or by loan from the Reconstruction Finance Corporation.

Foreign

Iraq



On the **Iraq Petroleum Company** operations, Caterpillar Sixty-five and Athey Truss Wheel trailer take pipe loaded by a British-built crane from a storage yard on the railway.

New England Notes

By C. BRUCE McCOWN

The accompanying picture shows the Bucyrus-Erie 37-B of **M. F. Roach & Sons** excavating the Bourne-Falmouth road on Cape Cod. The 37-B has a high mark of 2250 yards in eight hours and a two months' output of 60,000 yards, working eight hours per day. The operator, Louis Williams, is very enthusiastic about the 37-B. Louie formerly operated a 1035 for the Eastern Contracting Co. and is one of the smoothest gas shovel operators in New England.

An End Dump Car For Low Cost Operation

The answer to declining prices is lower production costs. The Western 20-yard End Dump car is a new development in haulage equipment, which within its range is an answer to this challenge.

This sturdy car is a radical departure from all previous dump car standards. It is short coupled and compact, and rides the track well. Its great strength makes it ideal for the hardest mining and quarry service.

Wherever material is stored in stock piles or overburden is wasted, the Western 20-yard air operated end dump car can be used to advantage. It permits the operator to keep his dump squared up and conserve space. It frequently can eliminate the building of trestles. It may be just what you need to reduce your production costs.

Complete information will be sent on request. Write today. There is no obligation.

Western Wheeled Scraper Company

Dump Cars and Grading Equipment

Aurora, Illinois, U. S. A.

WESTERN

Shots From the Firing Line—*Continued*

New York Notes

The New York Public Service Commission has approved plans and an estimate of cost for the elimination of a crossing of the Delaware & Hudson line and the Wallonsburg-Essex highway in the town and county of Essex. The plans call for the construction of a bridge over the Bouquet river to cost $30,600.

New Jersey Notes

By H. M. DAVISON

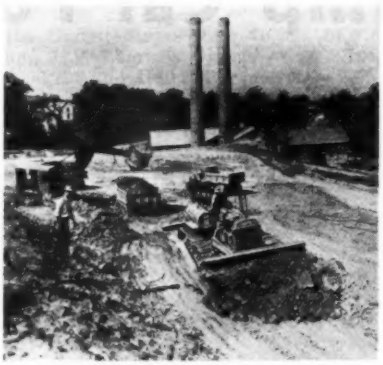
The accompanying illustration show the **International Excavating Company's** Gas+Air crane used in connection with bringing Raymond Boulevard under Broad Street in Newark. This construction is in the bed of the old Morris and Essex Canal where it ran under Broad Street and terminated at the Passaic River. It is now being converted into an Automobile Highway to bring traffic from the Oranges and west of Newark across the heart of the city without going through the existing heavy traffic on Broad Street. The terminus is at the Pennsylvania Railroad Plaza where the new station is being constructed.

Delaware Notes

George & Lynch of Dover were low on the Brenford to Seven Hickories 3.06 miles, 22,000 yards excavation and paving, at a price of $69,036.

Highway Engineering and Contracting Company of Selbyville was low on the Rehoboth-Indian River Inlet, 6.2 miles including 44,500 yards of excavation and furnishing and placing 17,000 yards of gravel. Excavation went at 35 cents for excavation, 65 for borrow and $1.65 for No. 1 gravel. Their bid was $67,940.

Ohio Notes



Here's a Caterpillar tractor with bulldozer doing a bit of grading on a **John F. Casey Company** job at Norwood. The work is on a connection to permit the Pennsylvania Railroad to enter the new Cincinnati Union Passenger Terminal over the B. & O. In the background you see a Linn tractor and several trucks loading at the Northwest that picks up the heavier grading.

Michigan Notes

By CLYDE B. DAVIS

New construction projects amounting to about $250,000 have been awarded recently by the Highway Commission of the Michigan State Administrative Board. Included was a job of grading and drainage structures on U. S.-41, Stephenson to Dygatt in Menominee County which went to **R. B. Vickery & Company**, Suamico, Wisconsin at $29,-841.

Eleven bids for the **Monroe harbor project** were opened by Maj. R. C. Crawford, U. S. Engineer in Detroit. The project, for which Congress appropriated $650,000, half to be repaid by the City of Monroe at $5,000 a year, is divided into two sections. On the first section, from Lake Erie up the River Raisin to the upper end of the U. S. Canal, **Construction Material Corporation** of Chicago was low with a bid of $372,800. On the second section, from the upper end of the canal to the Consolidated and River Raisin Paper Company docks, **R. C. Huffman** of Cleveland was low with a bid of $166,320.

Work on M-28 with RFC funds allotted to Chippewa County as a part of the $2,000,000 highway loan to the Upper Peninsula has begun with 96 men put to work near Strongs.

Edward N. Hines, Wayne County road commissioner, reveals that tunnels which Detroit has been preparing for, have been considered in all rights of way obtained during the past few years. Widths of 84 and 204 feet have become standard. "Engineers", said Mr. Hines, have decided that where subways are constructed, 84 feet is the minimum width at which shoring up a building is not necessary, so we have been getting 84 feet to do away with necessity of shoring up. The 204 feet represents the same 84 feet plus 120 feet for two 60-foot widths of paving on the superhighways, which will be pushed right through Detroit. Whatever the need of the future may be, beyond subways, even if additional surface roadway or airplane landing strips, the rights-of-way will be there, providing for orderly development in all directions and the saving of huge sums."

The tunnel between the new Grand Rapids civic auditorium and the Lyon street sidewalk across the avenue is to be 258 feet long and its inside dimensions are 8x7½ feet. The approximate cost is $16,000. **Owen-Ames-Kimball Co.,** 38 Pearl St., N. W., Grand Rapids, is the contracting firm.

Indiana Notes

By CLYDE B. DAVIS

The street resurfacing program for all parts of the city of Indianapolis is to cost $333,000 of which the city will pay $250,000 and abutting property owners will pay the remainder. The city's portion is to be paid out of the city's gas tax fund of about $600,000.

Kentucky Notes

Operator Osborne Shaw sends us the above snapshot of the Type B Bucyrus-Erie steamer which he operates for the **Cumberland Construction Company.** Note the home-made awning built in over the operator's front window.

St. Louis and Vicinity

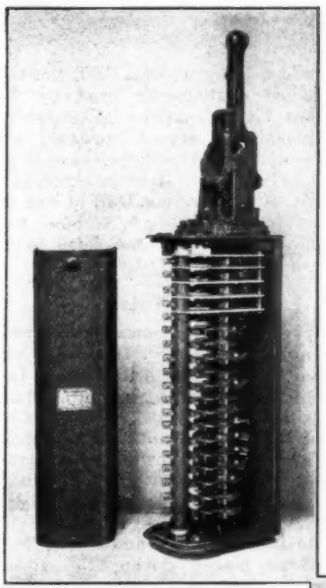
By A. J. KOENIG

The first letting for 1933 for highway work will be held at Jefferson City by the Missouri State Highway Commission on March 4th. The work consists of 102 projects, approximately 312 miles, and is divided as follows: 65 miles concrete paving, 23 sections; 4 bridges; 162 miles graded earth; 27 sections gravel, 85 miles.

M. E. Gillioz, Monett, and **Donald Pray,** his superintendent, are in the hospital at Springfield, both having been badly injured in an accident when Mr. Gillioz' automobile skidded off the pavement near Phillipsburg. Hope they will be out soon.

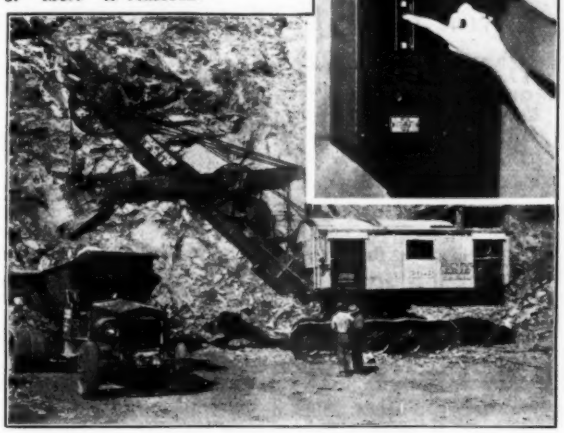
George G. Prendergast & Sons were low bidders for the construction of a section of the Humboldt Street sewer

Simplified ELECTRIC CONTROL *that cuts* SHOVEL MAINTENANCE



Left—The Westinghouse type A Drum Controller (cover removed) has easily renewable contact tips and segments.

Right—No lost time for fuse replacements with the new "De-ion" breaker for lighting and auxiliary power circuits. Just throw a switch after the overload or "short" is removed.



Westinghouse-electrified Bucyrus-Erie Shovel used by Macco-Lewis Construction Co., in excavating work near Los Angeles.

WHEN you buy a shovel electrified by Westinghouse, you are assured a greater return on your investment because your shovel is equipped with *simplified electric control* and sturdy, efficient generators and motors that reduce upkeep expense and greatly reduce power failures.

Following are a few of the low-maintenance features of the control:

Low-Cost Replacements—The drum controllers have renewable contact tips and interchangeable switch segments that permit remarkably quick, low-cost replacements. Every part of the controller is made accessible by simply removing a cover.

Long-Life Parts—Parts subjected to mechanical wear . . . such as switch segments, magnetic brake shoes and drums . . . are constructed of abrasive-resisting material, of proven long-life design.

Reduced Outage Time—The new fuseless "De-ion" circuit breakers for lighting and auxiliary power circuits provide positive overload and "short" protection. No time-out for fuse replacements—a mere flip of the breaker handle restores service instantly.

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● Let us send you a 40-page data booklet describing these and other Westinghouse shovel developments. Just mail the coupon.

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Company.....
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When writing to Westinghouse Electric & Manufacturing Company, please use coupon or card bound in this issue.

Shots From the Firing Line— *Continued*

which will extend from Broadway to a point 350 feet west of the Mississippi River. Their bid of $76,677 was 25 per cent below engineers' estimate.

The St. Louis Board of Public Service will receive bids on February 28th for the construction of the Poplar Street sewer. Work will consist of new concrete bottom and completing concrete shaft.

F. E. Ross, City Engineer, Jefferson City, asked for bids February 6th for constructing sewers in District No. 57. The work consists of furnishing and installing 760 feet of 8-inch sewer pipe; 280 feet of ditching and back filling; manholes; etc.

Plans are in preparation for the construction of a re-inforced concrete viaduct over the railroad tracks and adjoining the present structure on Grand avenue, from Market street to Chouteau avenue, St. Louis. The cost is estimated at $450,000.

Receivers for the St. Louis and San Francisco Railroad have been granted authority to expend approximately $720,000 for improvements and addition to road and two subsidiary lines, The St. L., San Francisco & Texas Ry., and Ft. Worth & Rio Grande Ry.

Harry J. Massman, President of Massman Construction Company, Kansas City, was elected president of the Missouri Chapter of the Associated General Contractors succeeding George F. Maitland.

The U. S. Engineers office at Chicago will receive bids March 2nd for excavating and dredging 1,145,000 cubic yards of earth in the Illinois River near Utica, Illinois.

The Gasconade River Power Company of Kansas City has applied for a federal license to construct a dam across the Gasconade river near Rolla. Specifications call for a dam 130 feet high and 1800 feet long, with turbines and generators capable of developing 60,000 horse-power. The dam will create a reservoir with a surface area of 15,800 acres. The estimated cost is $15,000,000.

A contract has been awarded to **M. J. Smith,** St. Louis for the excavation for a highway subway to carry the Laclede Station road under the tracks of the Missouri Pacific at Maplewood in St. Louis County. The reinforced concrete and steel structure, which will cost approximately $25,000, will be constructed by company forces.

If they had played golf, what notables might have said for publication:

Caesar: "I shot, I sliced, I bunkered."

John Paul Jones: "I have not yet begun to putt."

Perry: "We have found the balls, and they are ours."

Jackson: "Don't shoot until they're on the green."

Sherman: "Golf is hell."

Kansas Notes

Here's a Bucyrus-Erie 75-B horizontal thrust coal loader used by **The Clemens Coal Company** at Pittsburg. The machine is electric powered with G-E equipment. The dipper carries 3½ yards and as the illustration shows bites right in for a heaping load of the unblasted coal. The house is built with special extensions at the sides to enclose the running board area.

River Notes

A review of the construction work accomplished during the past six months ending December 31, 1932 shows a continued increase in comparison with past records as to yardage placed in levees. A total of 87,803,225 cubic yards of earthwork was placed during the above period as compared with 79,373,877 cubic yards placed during the twelve months from July 1, 1931 to June 30, 1932 and 88,640,527 cubic yards placed during the twelve

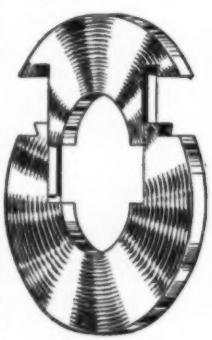
BIG SAVINGS

have small beginnings

THESE seemingly unimportant Beco Thrust Collars may lead the way to a considerable saving of money both by keeping gears and pinions in mesh and thus saving wear and by eliminating shut-downs for extensive repairs.

The first repair may save you the cost of a year's supply of Beco Thrust Collars.

No need to dismantle machinery. Beco Thrust Collars can be put on quickly and easily. They are securely fastened by tapping the overlatch in place.



When ordering give inside and outside diameters and thickness of washers required.

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UNLIKE equipment that is here today and gone tomorrow, Hayward Buckets are good for years of hard service. Contractors, construction companies and other Hayward users the country over know this.

Of just the right type (orange peel, clam shell, drag line or electric motor) which each job requires, a Hayward Bucket serves better and cheaper, because it is built exactly for the work on which it is used.

Write us your bucket requirements and get Hayward's new reduced prices now quoted on current orders.

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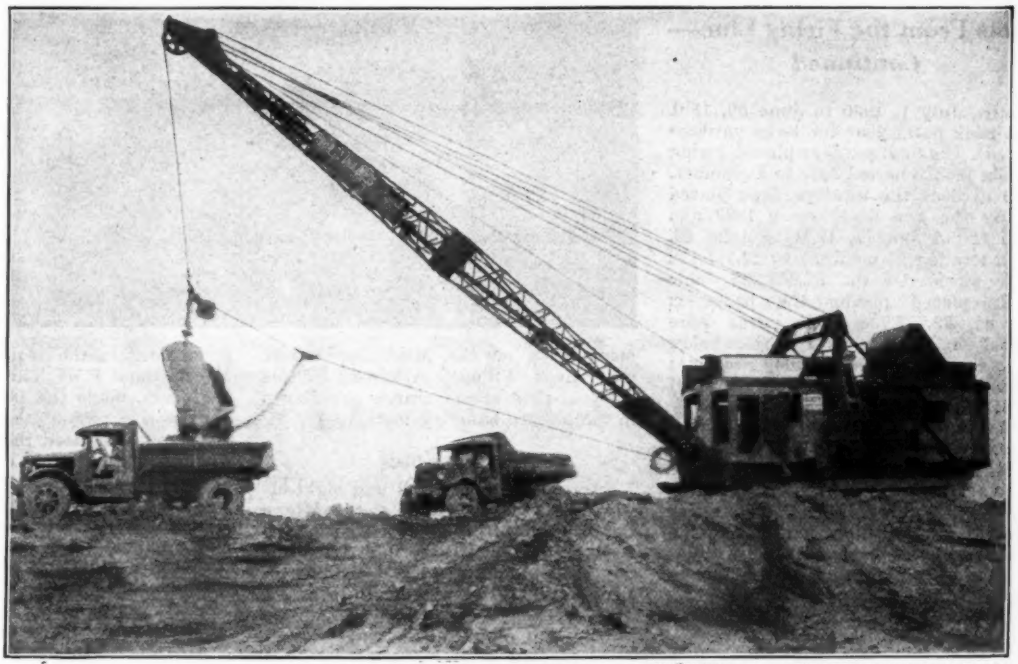

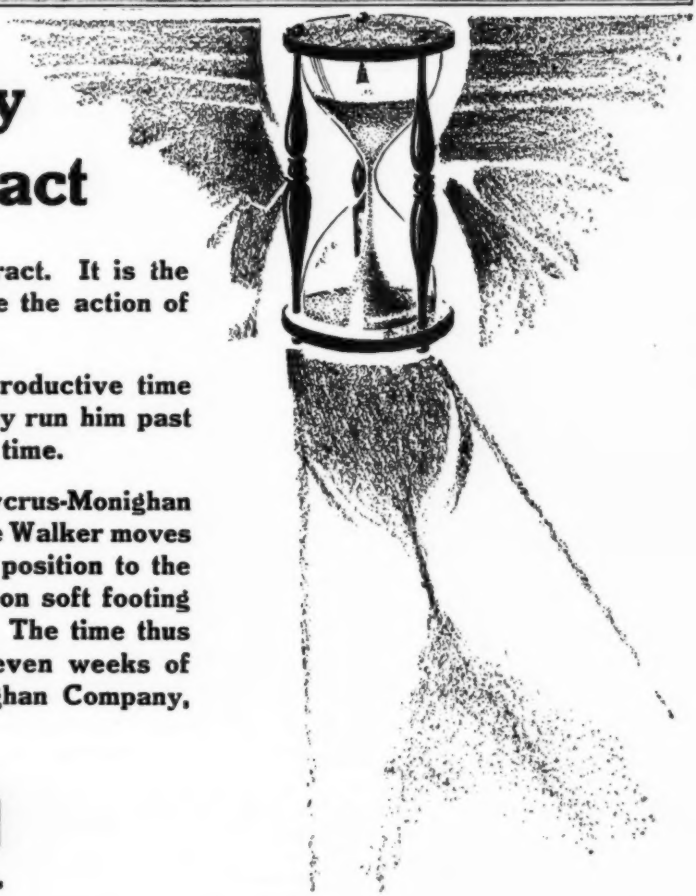

The Third Party to Every Contract

Time is the essence of every contract. It is the third party, without whose presence the action of the other two principals is void.

And the contractor knows that unproductive time increases the cost per yard and may run him past the completion date and into penalty time.

The *walking traction* of the Buycrus-Monighan Dragline cuts unproductive time. The Walker moves in a straight line directly from one position to the next. It works in wet weather and on soft footing that other machines can't negotiate. The time thus saved often represents days and even weeks of profitable digging. Bucyrus-Monighan Company, Chicago, Illinois.

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Shots From the Firing Line— *Continued*

months, July 1, 1930 to June 30, 1931 (the peak fiscal year for levee yardage placed). The total yardage placed during the six month period July to December, 1932 exceeds the total yardage placed during the two fiscal years 1929 and 1930 (from June 1, 1928 to June 30, 1930, totaling 25 months) by 22,105,172 cubic yards. Of the 87,803,225 cubic yards placed during the past six months, 82,777,704 cubic yards were placed on the main river project below Cape Girardeau, Mo., (under Section 1 of the flood control act of May 15, 1928) while the remaining 5,025,521 cubic yards were placed on tributaries and above Cape Girardeau, Mo. on Mississippi River, (under Section 6 of the same act). During the six-month period July to December, 1932, 39,555 linear feet (7.5 miles) of new bank protection was placed and a considerable amount of work in renewal and repair of bank protection works was also accomplished.

St. Louis District

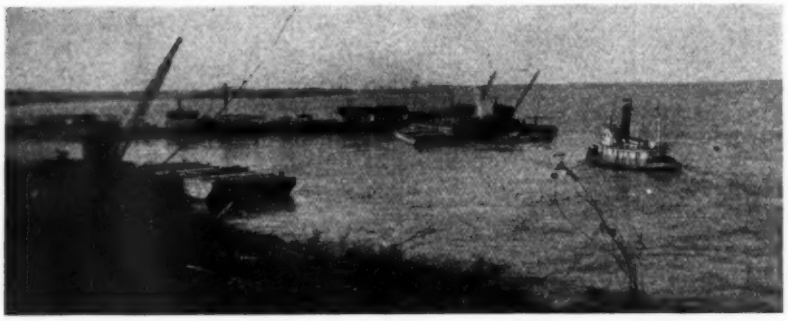
On February 17th the St. Louis office of the U. S. Engineers **took bids on 1,150,000 cubic yards** of levee rebuilding and enlargement in the Hillview Drainage and Levee District on the Illinois River in Green and Scott Counties, Illinois. One section calls for 600,000 yards on 30,240 feet with average height of 14.8 feet, the other calls for 550,000 yards in 18,660 feet at 15.8 feet average height.

Memphis District

Along the St. Francis River about 1½ miles northeast of Carryville in Clay County, Arkansas, **Contractor G. S. Croxton** of Fayette, Mississippi is building the above levee. At high water stage excessive pressure was thrown against the old levee on this side which was considerably weaker at this point than that on the Missouri side of the river. Throwing in the dirt is a Bucyrus-Erie 45-B equipped with LeRoi gas engine, Kohler light plant, 65-foot boom and Bucyrus-Erie Type-U, 2-yard, Red Arch bucket.

Vicksburg District

Through the courtesy of U. S. Engineer **R. C. Hurst**, we reproduce herein an interesting snapshot showing revetment work on the Mississippi River near Lake Village, Arkansas. Three Bucyrus-Erie steam cranes are shown in the picture handling mats.



Texas Notes

Surveys are completed and right-of-way has been acquired by the **Moran Corporation of Texas** for the laying of a natural gas trunk line from the Conroe field to Houston, a distance of 35 miles. The line will be 10-inch.

Colorado Notes

By H. M. BIBAUD

Highway officials of Colorado, Wyoming, New Mexico, Kansas, Nebraska, and Montana met for a two day program, January 19th, at the University of Colorado. The conference is held annually under the auspices of the engineering department of the university. Two hundred engineers were present at the opening session. Construction and maintenance of oiled and bituminous roads was one of the principal topics of discussion.

The Wisconsin Bridge and Iron Company of Milwaukee, was low with a bid of $98,223 on the contract to build a bridge over the Colorado River at Grand Junction.

Contracts for two highway construction projects were awarded to the **Driscoll Construction Company** of Pueblo, February 1st. The Driscoll bid was $59,820 on the construction of four bridges and graveled approaches south of Walsenburg and $53,114 for construction of 4.5 miles of gravel surfacing between Walsenburg and Aguilar.

The new highway between La Junta and Walsenburg has been completed in Otero County and is ready for travel. Grading the strip through Pueblo County is now under-way. When completed the new highway will connect with U. S. Highway 450 at Walsenburg and will shorten the distance from Rocky Ford to Walsenburg by forty-five to fifty miles.

The original million dollar Williams Fork transmountain diversion plan has been expanded into a $2,250,000 project, and the Denver-Golden-Metropolitan Mutual Water association was organized to apply to the Reconstruction Finance corporation for a loan to finance construction. It is estimated that the cost will be only $58.50 an acre foot and that the project will pay for itself in thirty-five years. A two-mile tunnel between South Fork and Middle Fork is included in the requirements. R. L. Meekers and E. H. Thwaits, consulting engineers, made the investigations regarding the cost of the combined projects and submitted the same to A. D. Quaintance, chairman of the commitee of citizens concerned. Due to this report it was decided to increase the size of the loan to be applied for to the figure named.

Pople Brothers Construction Company of Pueblo was low bidder on the contract to build 4.8 miles of gravel surfaced road east to La Veta Pass.

A draft of the loan agreement which would be acceptable to the **Twin Lakes Reservoir and Coal Company** has reached Washington and was to be presented to the Reconstruction Finance Corporation at once, according to word received from Frank N. Bancroft, Denver special attorney for the company. In case of the final granting of the loan, the one and one-quarter million dollar loan for irrigation purposes will be used to tunnel under the continental divide near Leadville and bring Roaring Fork river water to the eastern slope.

Herbert C. Lallier of Denver, President of Lallier Construction Company, was seriously, if not fatally injured in an automobile collision February 2nd. Mr. Lallier is receiving treatment at Mercy Hospital.

Construction of a drainage system on the Uncompahre and Grand Valley projects will be started January 1, 1934 and the payments due the Uncompahre and Grand Valley projects will be deferred for part of 1932 and all of 1933 under a bill approved by the House Irrigation Committee in Washington, D. C.

Pat and Mike were detailed for scout duty overseas. The commanding officer ordered them to conceal themselves in a cow's hide and pretend to graze over toward the German trenches. Pat was given the front legs and Mike the hind legs.

All went well until Pat received a prod from his buddy.

"Come on, let's get out of here," hissed Mike.

"What's the matter?" inquired Pat.

"Matter!" snorted Mike. "Migawd, here comes a German with a milk pail!"

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Smart Guy: "What! They out again?"

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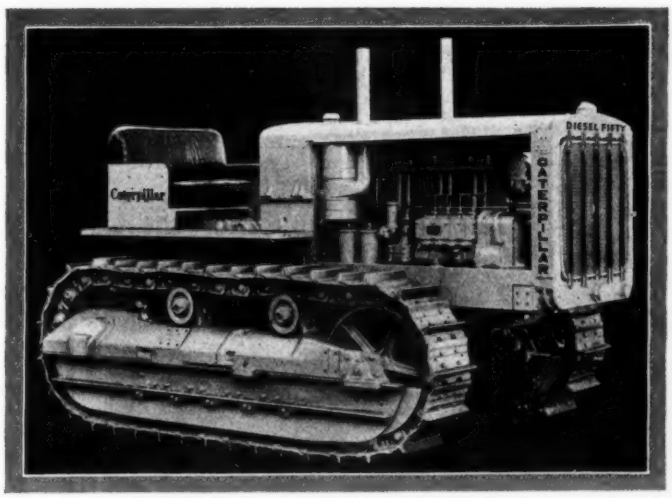

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Shots From the Firing Line—*Continued*

New Mexico Notes

BY DAVID I. DAY

The longest New Mexico grade and drain road construction job to be seen the closing weeks of 1932 was completed about January 1, 1933. This was in Dona Ana county, an 18.863-mile stretch of road which will be surfaced later. No plans have yet been made as to the surfacing work, according to State Engineer W. R. Eccles. The grade and drain work was done by **A. O. Peabody**, the well-known highway contractor of Las Cruces, New Mexico. This job, listed as 176-B, Federal Aid Project, cost approximately $155,000. The feature of the construction was the very efficient organization. The accompanying photo shows a 1½-yard Northwest shovel working in the vicinity of Orgas Pass.

At the bidding of the State Highway Department on February 7th, **Cook and Ransom** of Ottawa, Kansas took two jobs totaling $198,373; **Hayner and Burn** of Las Cruces and **Skousen Bros.** of Albuquerque secured a contract for $86,976; and **F. D. Shufflebarger** of Albuquerque received an award for $162,562.

California Notes

Starting at an elevation of 6,900 feet, **Contoules Construction Company** is grading the Generals Highway in Sequoia National Park across the 7370-foot summit of the Sierras just north of Little Baldy Peak and dropping down the eastern slope to 6840 feet. Although only 2.88 miles in length, this roadway project involves 127,000 yards of roadway excavation, practically all of it in granite, and 40,000 station yards of overhaul. Fills as high as 50 feet and cuts as deep as 20 feet are called for by the profiles. The work was commenced August 6 last year and suspended for the winter in December. It is hoped to resume it in April. The accompanying illustration shows a Caterpillar Fifty dumping a LeTourneau chariot on one of the fills. 5-yard Sterlings are also used for hauling. Other equipment includes a Northwest shovel, Allis-Chalmers tractor, LeTourneau

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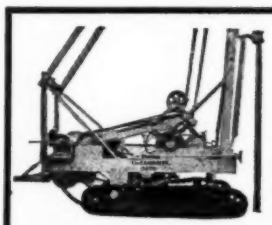

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Shots From the Firing Line— *Continued*

bulldozer, LeTourneau winch, etc. Trees near the site of any blast are protected with corrugated steel shields. Rock thrown off the right of way, or outside the neat lines of construction, are dragged back by the power unit, picked up and either used in a fill or removed to a designated point, so that there remain no scattered rocks along the roadside. Much attention is given to landscaping, with all slopes rounded or flattened and, in general, the natural topography disturbed as little as possible by construction of the grade.

San Francisco and Vicinity

By H. L. LIVINGSTON

The County Supervisors of Los Angeles County have been granted a loan of $1,770,000 by the Reconstruction Finance Corporation. The County will spend this money on roads as an employment stabilization measure. It is estimated that between 20,000 and 30,000 men will be put to work immediately.

E. F. Scattergood, Chief Engineer of the Bureau of Power & Light, Los Angeles, has prepared and itemized the approximate amount of material that will be used in the construction of the transmission line from the power plant at Hoover Dam to Los Angeles. The length of this power line will be 271 miles. It is estimated that within the next two years that the cost of this line will probably reach $41,300,000. This line will have a capacity of 215,000 K.W. at 275,000 volts pressure.

The following contracts for the San Francisco Bay Bridge are coming up in the month of March:

March 2—East Bay Substructure Contracts

March 7—West Bay Superstructure and Cables and Attachments

March 7—Yerba Buena Island Crossing, including tunnel, anchorage and viaducts (estimated cost $2,261,000.)

March 8—San Francisco Anchorage, including approach to top of Rincon Hill (estimated cost $1,580,000.)

March 8—Superstructure, East Bay Crossing (estimated cost $1,191,000.)

The Metropolitan Water District has cancelled all bids for the construction of the Valverde and Bernasconi Tunnels of the Colorado River Aqueduct. New revised specifications will be issued for this work at an early date.

The Union Paving Company of San Francisco has been awarded the contract by the California Division of Highways for 6.4 miles of grading and oiling between Saratoga Gap and Black Road, in Santa Cruz and Santa Clara Counties. The amount of this contract was $288,468. The principal item of work on this contract is 940,000 cubic yards of roadway excavation.

The accompanying illustrations show a Bucyrus-Erie Model E-2 which rolled over the bank in the Feather River Canyon. This machine belongs to the **California State Highway Commission.** No one was injured when the shovel rolled over the bank and after pulling it back up on to the road, it resumed work with very few repairs.

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Shots From the Firing Line— *Continued*

The Bureau of Public Roads, San Francisco, has awarded a contract to **J. E. Haddock** of Pasadena, in the amount of $138,119 for grading Section "C," Route 62, of the San Gabriel National Forest Highway in Los Angeles County. Principal item of work on this contract was 358,000 cubic yards of unclassified excavation.

The California Division of Highways has awarded **Hemstreet & Bell** of Marysville the contract for 6.1 miles of grading and surfacing the highway between Keough Hot Springs and Bishop in Inyo County. The amount of this contract is $81,672.

The Metropolitan Water District of Los Angeles has awarded the **Morrison-Knudsen Company** of Los Angeles a contract for constructing approximately 36 miles of the Coachella Valley and Berdoo Canyon road. This contract amounts to $132,184.

FRANK G. MANLEY

We announce with regret the death of Frank G. Manley at the age of 71 on January 30, 1933. Mr. Manley died from a heart attack attributed to injuries suffered sometime before in an automobile accident. He was one of the pioneer mining men of the West and took several very large fortunes out of Alaska. At the time of his death, he was a member of the San Francisco oil firm of Manley & McGinn. Mr. Manley is survived by a widow and two sons.

Application has been filed with the State Division of Water Resources for 614,000 acre feet per annum from the South Fork of the American River in El Dorado County for a water supply for the city of Sacramento. Definite plans will be submitted later. This work involves a concrete dam 330 feet high and 1280 feet long, also a storage reservoir of 714,000 acre feet capacity and a concrete or steel pipe conduit. The estimated cost of the above work is $9,000,000.

Los Angeles and Vicinity

By D. BANKER

The United Concrete Pipe Corporation of Los Angeles was to begin grading and paving of 10.2 miles of Pomona-Colton boulevard on February 15. Contract, totaling $309,386.30, was awarded on February 1 by the State Division of Highways. It provides for realigning of the boulevard between Ontario and Bloomington, and for grading of the highway to 36-foot width. The grade line will be raised in an effort to eliminate frequent blockades of the highway during sandstorms. The highway will be paved with concrete to a 20-foot width. Construction is to be with Federal Aid funds loaned to the state and to be repaid through the gasoline tax. The 30-hour week will be in effect, and two working crews will be employed in five-hour shifts to complete the contract by June 30.

Oswald Brothers of Los Angeles submitted the low bid of $171,856 to the California division of highways on February 1 for 11 miles of grading and paving of the Ocean-to-Ocean highway now under construction. The contract is for that portion between Edom and Indio in Riverside county.

Washington Notes

Army Engineers have approved plans for the construction of a bridge across the Narrows of Puget Sound near Tacoma and approval of the Secretary of War is expected soon. The bridge will consist of a central span of 1,200 feet long with a clearance of 196 feet and will cost $3,000,000.

Hawaiian Notes

By P. H. KRAFT

The award to low bidder **E. E. Black, Ltd.** on a new Pacific Heights water system on a 30-hour per week basis is thought to be a precedent that many future public works jobs now contemplated will follow. Work will begin shortly.

A large building program is nearing completion at Kalaupapa, the leper settlement.

The Government's appropriation to widen and dredge the harbor at Honolulu has been read with wide interest. It is more than probable that the Hawaiian Dredging Company will be awarded all or a part of the contract and will use their Bucyrus-Erie equipment.

About $22,000 will be spent by the government on pier 5. Most of the work will be installation of new piers and flooring. This pier is used by all army and navy transports, also a coast guard cutter.

Honolulu Plantation Company has installed 1,000 feet of 24-inch riveted steel pipe and 1660 feet of 24-inch reinforced concrete pipe. The new main carries the water up a steep gulch through the steel piping, thence to an upper level ditch through the concrete section which was laid under a cane field.

JOHN H. McKENZIE

The funeral of John H. McKenzie, 74, prominent mining engineer who died in San Francisco was held in Honolulu. Up until about 20 years ago he had made his home here.

Nearing completion is the huge **Aloha Stadium** which will house various special events.

Book Reviews

Foremen's Safety Conferences, a new publication issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Company, presents one method which is being used rather extensively to develop safety interests among foremen and others in supervisory positions. The report offers suggested programs for a series of seven informal conferences to discuss the various phases of safety work, these meetings being presided over by some such representative of the management as the works manager, the general superintendent, or the director of safety. The programs, which are confined to the fundamental principles of safety work as applied to all types of industry, were developed following a review of the activities of a number of industrial organizations in the United States.

In order to provoke general discussion, a series of nine questions is presented for each of the seven conferences. To aid the conference chairman in determining the scope of each question, the purpose is presented briefly; this is followed by a condensed statement giving general information on the subject, which is intended as a guide to the presiding officer in preparing additional questions and in stimulating discussion whenever it tends to lag. The following subjects are included in the progam of conferences: The Reasons for Safety Work; Using Facts to Prevent Accidents; Getting the New Employee Started Right; Helping "the Accident-Prone" Employee; Getting the Department Behind the Foreman; The Value of Safeguarding Equipment; The Effect of Good Housekeeping on Safety and Operation.

A limited number of copies of **Foremen's Safety Conferences** are available for distribution to manufacturing executives, safety engineers and others who may be interested in this phase of accident prevention. The report may be obtained by addressing the Policyholders Service Bureau, **Metropolitan Life Insurance Company**, One Madison Avenue, New York City.

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INDEX FOR VOLUME XXVI
January to December, 1932, inclusive
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Dredging on the Panama Canal, $2.50

By John G. Claybourn, Member A. S. C. E. and S. A. M. E. Superintendent, Dredging Division of the Panama Canal. (A. Kroch, Chicago, Publisher.)

For the past twenty-one years the author has been associated with the construction, maintenance and improvements of the Panama Canal. The material in this book first made its appearance as a paper presented at the first meeting of the Panama section of the American Society of Civil Engineers. The author says: "If an excuse for the publication of another book is forthcoming, it may be found in the important part dredging has played in the Canal construction and is playing elsewhere in commercial life; in the absence of information in published works on the subject. . . ."

This dredging story of the Panama Canal is supplemented with a large number of section views and statistics and presents a history of the methods employed and equipment used in the construction of the Canal which has involved, to and including 1930, the excavation of 351,798,200 cubic yards of material. It details development of machinery to cope with new problems as they appeared, and with the view of increasing output and lowering costs.

We mention here a few of the many interesting facts Mr. Claybourn brings to light in his book:

The total value of the Dredging Division property is approximately $10,000,000, which includes about 80 major items of equipment ranging in value from $2,000 to $1,000,000 each. About 125,000 barrels of fuel oil are consumed during the average year, while the electric power consumption is about 3,000,000 K.W. hours per year. 500,000 pounds of dynamite are used annually. The payroll of the Dredging Division approximates $1,200,000 per year. A field party of 30 men are at work constantly controlling the spread of hyacinths and other noxious water plants, while the work of removing driftwood extends over a channel length of about 20 miles including Chagres River and annually nets 2,000 cords of driftwood.

It is interesting to note that since the opening of the Canal in 1914 and up to the end of 1930 wet excavation has annually averaged 6,800,000 cubic yards of excavation. This total includes the slide material moved; channel improvements; drainage control basins; siltage removal and other general maintenance work. In commenting upon the problem of slides which in former years gave the engineers much difficulty, Mr. Claybourn says:

"Slides are becoming increasingly infrequent, but cannot as yet be considered at permanent repose, and, until this status is reached, dredging work must continue as an activity which bears more the aspect of a construction enterprise than that of maintenance operation."

If you are interested in receiving a copy of this book address your order and check or money order for $2.50 to John Claybourn, Department of Operation and Maintenance, Pedro Miguel, Canal Zone.

A new bulletin which interestingly illustrates and describes an improved method of boring in place of open trench digging, has just been released by the **Hydrauger Corporation**, 233 Broadway, New York City.

This bulletin shows, in graphic form, the Hydrauger method of mechanically boring under pavements, railroad tracks and other obstructions. It illustrates, by use of graphs, the exact cost of boring different distances in different diameters and also shows the speeds and degree of accuracy with which bores can be made. Beautifully printed in five colors, it describes the new Hydrauger models, parts, and quotes complete specifications. Copies can be procured from the manufacturer.

The 1932-33 edition of **Mac's Coal Directory and Buyers Guide**, published annually by the Coal Information Bureau, Union Trust Building, Pittsburgh, Pa., is now off the press and ready for distribution. Established in 1920 with 132 pages and three section, this publication has made conservative growth, constantly adding new and up-to-date information on the practical side of the coal industry. Compact, useful information on coal and coke and allied industries are contained in approximately 500 pages and ten sections. Price $10.00 per copy.

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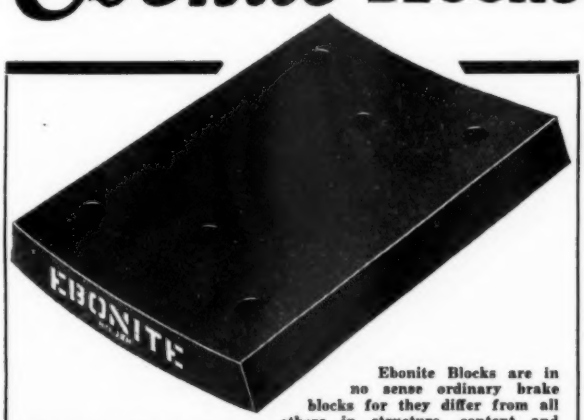

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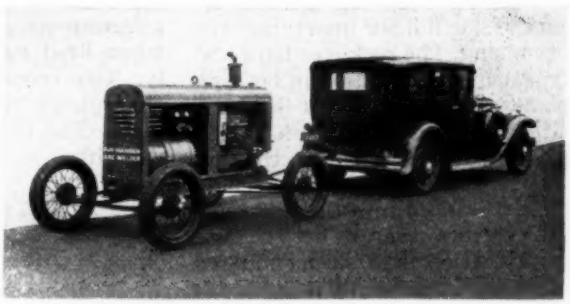

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Improving the Peruvian Port of Callao

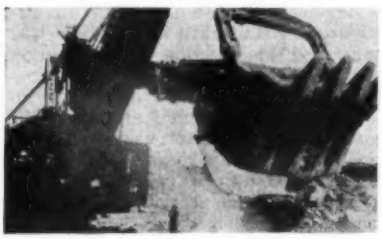
(Continued from page 113)

2. Machine shop. This was very complete, equipped to do all repairs for shovels, locomotives, cars, and so forth. Practically no work either here or in the port works was ever sent away to bigger shops.

Besides the two main units there were a warehouse, steel sharpening shop, engine pit, sheds for repair gangs, dispatch tower and so forth.

Tunnel method used for blasting

The site picked for the quarry was the west side of the hill, mainly represented by two long ridges of about 200 feet length



The dust flies when this fellow goes into action.

projecting from the hill. As work advanced these ridges disappeared and the quarry eventually had but one face. The general aspect of the hill for quarrying was promising. The rock was hard and igneous. The variation in bedding planes promised rock of different sizes. The overburden was negligible. The approach to the hill was easy. Later studies, as shoveling advanced into the hill, gave us evidence that a heavy false stratification had been imposed on the hill practically on an angle of 90 degrees to the original and thereby blocked out the rock in squares. It was evident that the tunnel method here had great advantages over any other drilling method, and even before a complete map of the hill was available an experimental tunnel was started in order to gather necessary data. We soon found that black powder as an all round explosive gave most satisfactory results and that single rows of charges placed parallel to the face acted best. With these two golden rules of experience our work was standardized and blasts were pulled with clockwise regularity and efficiency. It was soon evident that the bigger the blasts the steadier the shovel output. The average size of the blast in the first year was to break 26,459 cubic meters of rock, the second 49,-159 meters and the last year 67,-884 meters.

Of all the blasts made with the single row of charges blast system the 29th was the most comprehensive and also the most successful. It took in the whole length of the south hill, with a total distance between end charges of 540 feet. Eighteen charges were laid out in a single row with the distance between set at 30 feet from center to center. The height of the rock bank varied from a minimum of 70 feet to a maximum of 180 feet, being at the maximum for the 13 charges lying in the center of the hill. The charges were laid about 28 to 55 feet back from the toe. The blast was served by three tunnels in the form of capital T's. The amounts of explosives used were: 74,150 pounds black powder, 1025 pounds 40 per cent gelatin and 140 pounds 62 per cent gelignite as primers. The blast when fired behaved magnificently. The cooperation of charges throughout the blast was complete. The whole slice of the hill was lifted in the air and thrown forward. The distance from the center of the charges to the toe of thrown material was 280 feet at its maximum.

Tits and winzes found most practical for carrying charges.

The size of all the tunnels used was made as small as possible, generally four feet six inches by three feet. When the main tunnel had been finished the "tits" were started at the location of every charge. These were ten feet long and at the end of each was sunk the winze. This system of tunnels, tits and winzes, was our standard all throughout the job. The advantage of placing the charges in winzes rather than in any other way are numerous. First of all it has reference to the very nature of any explosive. The better confined any explosive is the faster is its detonation velocity. Other advantages are more practical ones:

First: it is easier and safer to pack a charge into a winze than to lay it in the tunnel. Second: any number of charges may be going into place at the same time, in fact one may have several parties loading at the same time, thereby speeding up the loading, while when laid in the tunnels, only one charge may be placed at a time, and before the next one may be placed backfilling must reach this site. And last but not least, it has great advantage over any other system in the case of an interrupted wire-connection anywheres in the blast. The whole main tunnel may be dug out and

Looking down the track into the quarry, two Bucyrus-Erie 100-B steamers in the background. Note the size of the rock as compared to man in foreground.

charge by charge checked without disturbing them until the break is found and corrected independently.

The winzes were always made big enough to receive the total charge below tunnel floor level and generally leaving a couple of feet for a layer of soft tamped dirt above it. We preferred always to connect our blasts in series. A parallel connection can't be fired by a blasting machine. And to insure us against any possible break of wires we always used a double system of wires.

Experience in blasting itemized

Our loading factor and tonnage factor for the total number of

Above: After a blast—beautiful shoveling. Below: United after 26 months of struggle.

blasts fired showed the following experience:

Year	Total Explosives	Meters in Place	Loading Factor	Tonnage Factor
1928	185,266 pounds	160,353.9	1.16	89.9
1929	395,641 pounds	387,313.9	1.02	82.2
1930	115,000 pounds	123,426.7	0.98	138.6
Total	695,907 pounds	670,490.3	1.03	92.5

The downward movement of the value of the loading factor has in part been due to increased efficiency in blasting, but was mostly due to the increase of the size of the blasts.

In the tunnel advance we used entirely Ingersoll-Rand jackhammers R-12 for dry as well as wet drilling. Our advance pounds of explosives used for the different years are:

Year	Tunnels Driven	Pounds Explosives	Pounds per Foot	Total Man-Shifts	Feet per Man-Shift
1928	4,765′	16,683.1	3.60	3076	1.54
1929	6,882′ 6″	22,292.0	3.24	4962	1.39
1930	1,015′ 6″	6,246.0	6.15	977	1.04

Comfortable bungalows were furnished to employees.

To advance a tunnel one foot we used 3.57 pounds of Gelignite. To 2.17 feet per round drilled. We drilled in the tunnels 183,424 feet, which when added to the surface drilling of 18.386 feet, makes a total of 201,810 feet for the quarry. In drilling this 201,-810 feet we used a total of 1501 feet of 1-inch hollow hexagonal Ingersoll-Rand drill steel. We sharpened a total of 61,678 drills during that time and used 37.66 tons of light Diesel fuel oil in the furnace. The sharpening of one drill steel required 0.61 kilogram of fuel oil.

Bucyrus-Erie shovels stand up under terrific punishment

To handle the tonnage of rock the company purchased two Bucyrus-Erie 100-B steam shovels of the standard make equipped with oil burners. From earlier experience they had learned the reliability of these machines. We have probably put these shovels through a more gruelling test than any of their kind before, operating for the major part on a 24 hour basis for six days a week and under difficult conditions, such as bad water, unreliable mechanics, careless operators and so forth. Of course, our major trouble was always the boiler, but these troubles are more or less a necessity on account of the nature of the boiler and the work it is required to do. We changed boiler tubes a total of five times on the two shovels using the old tubes over again by welding on new pieces of about eight inch lengths and toe-nailing them over. The record of production per set of boiler tubes is:

Shovel No.	Date When Flues Changed	Number of Shifts Operated (8 hours)	Cubic Meters Loose Meas. Rock Loaded
14	November 1, 1929	585.2	377,395 cu. meters
	April 26, 1931	564.0	258,165 cu. meters
15	February 1, 1929	136.5	116,220 cu. meters
	January 1, 1930	548.0	345,555 cu. meters
	March 10, 1931	405.0	175,942 cu. meters

On one shovel we got an average life of 574.0 shifts out of every set of flues and loaded an average of 317,780 cubic meters loose measure rock or 518,000 tons. The other gave us 363 shifts per set of flues and 212,572 cubic meters rock or 346,492 tons loaded. The average is 477.7 shifts of operation per set of flues and 254,655 cubic meters loose measure rock or 415,087 tons loaded. The average is 477.7 shifts of operation per set of flues and 254,655 cubic meters loose measure rock or 415,087 tons loaded.

The fuel oil consumption for the different years are also illustrated:

1928—2.06 kilogram fuel oil per cubic meter rock loaded

1929—2.35 kilogram fuel oil per cubic meter rock loaded

1930—3.80 kilogram fuel oil per cubic meter rock loaded

Fuel consumption for total operating time averaged 2.61 kilograms

per cubic meter rock loaded.

The fuel oil as well as the water was hauled in tank cars from Callao, pumped up in tanks on towers about 30 feet above quarry floor level and by gravity feed to the places of consumption.

The most interesting feat of these shovels was that we did all through the job a sub level digging of about four feet. This was only possible by the sturdiness of the shovels and the favorable dip of the stratification.

Record output for shovels 55,016 yards rock in month

It took the two shovels exactly 26 months to produce the 1,251,728 cubic meters needed for completion of the breakwaters and rock fill used for the dock work.

	Shovel No. 14	Shovel No. 15	Total
Production	626,924.0 cu. meters	624,804.0 cu. meters	1,251,728.0
Total shifts operating	1,096.5	1,048.8	2.145.3
Total shifts loading cars	464.0	464.7	928.7
Cubic meter loaded per operating shift	572	595	583
Tons fuel oil consumed	1,641.7	1,622.5	3,264.2

Other data of interest from the records of this job: we hoisted an even 120,000 tons of rock per life of hoist cable, and dug 80,000 tons per set of teeth.

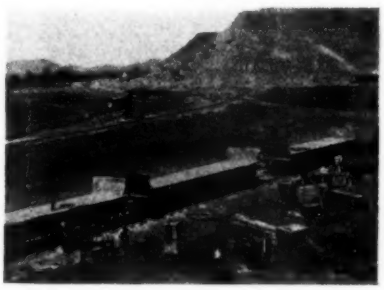
The maximum output reached was 42,061 cubic meters of rock in a month.

Following is a list of the most interesting records of the shovel operation:

Average life of one set of tubes	447.7	shifts
Average life of one firebox lining	78	days
Average consumption of fuel oil	466	U. S. gallons (8 hours)
Average output per 8-hour shift	533	cubic meters
Maximum output per 8-hour shift	1088.6	cubic meters

The quarry was arranged so that each shovel had half the quarry for its operation. Likewise the blasts were arranged so that they generally comprised half the length of the quarry face. Therefore as soon as one shovel would cut out and track could be pulled a blast was ready and could be fired. We experienced therefore even under the heaviest blasts only a paralization of half the quarry. The shovels were served by three rock trains each of seven 30-yard, 3-side, hinged-two-ways, air-dump, steel cars of Magor make, and pulled with a Vulcan Saddle-Tank 50-ton locomotive. The arrangement worked out so that one train would be dumping on the trestle, one would be on its way down and one loading at the quarry. To be able to use both shovels for loading, the train was split and one shovel spotted its cars with the dippersticks.

These big fellows for topdressing were loaded by 100-B shovel.



Repairing dump cars at the quarry.

POSITIONS WANTED

Positions wanted or help wanted advertisements will be run under this heading for 5 cents per word, minimum charge $1.00

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

CONSTRUCTION SUPERINTENDENT

I have 20 years' experience as shovel operator, master mechanic, erector of construction machinery and highway foreman. Willing to accept position with any construction company. Can furnish the best of references. Address Box 5103.

DRAGLINE-CLAMSHELL-SHOVEL OPERATOR

Have 20 years' railroad, quarry, drainage, levee and highway experience operating Bucyrus-Erie and Northwest shovels and draglines, gasoline, steam, Diesel and electric machines. Willing to go anywhere on any machine. Can furnish good references and do own repair work. Married. Present location, Indiana. Box 4101.

MINING ENGINEER

Mining Engineer, 34, married, fluent Spanish, desires position with responsible company. Experience — two years assistant engineer gold mine; three years foreman in large underground copper mine; six years foreman to mine superintendent open pit operating 25 electric shovels and draglines. Available immediately. Location, Maryland. Box 3801.

ENGINEER-SUPERINTENDENT WANTS CONNECTION WITH CONTRACTOR

Twenty years' exceptional experience in factory construction, rock work, roads, dams, tunnels, hydro-electric developments, foundations. Has produced results under difficult conditions and can handle large program in whole or part. Eight years Latin America. Go anywhere. Box 5102.

DRAGLINE—CLAMSHELL—SHOVEL OPERATOR

Have operated gasoline, electric and steam machines for past 15 years. Willing to go anywhere. Married, 36 years old. Best of references. Can do own repairing. Present location Minnesota. Box 3901.

SHOVEL OPERATOR

Have 14 years' experience on Gas+Air, straight gas and steam shovels. Willing to go anywhere in U.S.A. Married. Best of references. Can do own repair work. Present location, Minnesota. Box 3902.

SHOVEL OPERATOR

33 years' experience on full revolving shovel and railroad type shovels on all kinds of highway, grading, coal stripping and construction work. Familiar with both small and large machines. Can do my own repairing and furnish class A references. Willing to go anywhere. Present location, Pennsylvania. Box 5201.

DRAGLINE-CRANE-SHOVEL OPERATOR

Have had 15 years' experience on Diesel, electric and steam machines on levee and stripping operations. Will go anywhere. Married. A-1 references furnished. Can handle own repair work. Present location, Illinois. Box 3803.

FOREMAN—ESTIMATOR—ENGINEER

15 years' experience construction field as above. Age 34, married, war veteran, not afraid of hard work. Graduate University of Wisconsin College of Engineering. Will go anywhere. Excellent references. Available September 1st. Location, Illinois. Box 3703.

TRANSITMAN — OFFICE WORK

Experienced transitman with mining experience desires transit work, or will work as rodman, chainman or engineer's helper. Have also had experience as timekeeper, and much experience in safety work. Good references. Located Wisconsin, will go anywhere. Box 3513.

DRAGLINE-CLAMSHELL-SHOVEL OPERATOR

18 years' all around experience on highway, drainage and mine work. Will go anywhere. Can do own repair work. Reliable references. Present location, Florida. Box 3802.

CONSTRUCTION AND MAINTENANCE ENGINEER

Over 25 years' experience on all types of shovel, cranes, locomotives on general construction work. Capable of taking full charge of crew. At present located in Australia. Available for work in New Zealand, China or Federated Malay States. Can furnish excellent recommendations. Address replies to W. J. A., 22 Ruthven Street, Waverly, N.S. Wales, Australia.

ENGINEER-FOREMAN-SUPERINTENDENT

Seven years' experience for Guggenheim Bros. in Bolivia and Chile as mining engineer and mining foreman. Later joined Snare Corporation as quarry engineer and in charge of all blasting, railroad work, maintenance and crushing plant, later in full charge of quarry. Assigned to plan excavation for spillway and construction on the dam of the Malpaso Power project for the Cerro de Pasco Copper Corporation in the Peruvian Andes. At present employed as quarry superintendent in Europe but would like to secure more responsible position preferably in South America. 36 years old, married, no children. Graduate Norwegian Technical College with one year post-graduate work at Columbia. Talks fluent Spanish, German, English, Scandinavian and fair French. Capable of planning and directing almost any type of excavating project. Write Box 5301.

DRAGLINE-SHOVEL OPERATOR

Have 18 years' experience on drainage and highway work. Will go anywhere in U.S.A. Married. Can do own repair work and furnish reliable references. Present location, Florida. Box 5302.

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Small Shovels
Under 2 Yards

Two 20-B Bucyrus steam shovels. Located Aurora, Illinois. Price each $1500.

30-B Bucyrus steam shovel. Located Charleston, Mississippi. Price $1500.
Box 303-SS.

BUCYRUS-ERIE EXTRA HIGH LIFT TYPE B-2 steam shovel, 21-foot 3-inch boom, 16-foot dipper handle, one-yard inserted tooth dipper, single shaft "cat". Excellent condition. Will sell or rent. Box 384-SS.

OSGOOD GASOLINE ONE-CUBIC-YARD COMBINATION SHOVEL-CLAMSHELL-DRAGLINE. Six cylinder Beaver motor. Overhauled late 1931. Bargain price. Box 323-SS.

BUCYRUS-ERIE 20-B steam shovel ¾-yard Dipper. $1,000. Chicago territory. Box 348-SS.

THREE TYPE A BUCYRUS-ERIE STEAM SHOVELS. Good value. $500 each.

FOUR TYPE B BUCYRUS-ERIE STEAM SHOVELS. Good operating condition. $1000 each. Box 328-SS.

ONE 18-B BUCYRUS-ERIE, ⅞-yard dipper on full revolving caterpillars. Box 182-SS.

BRAND NEW PAGE DRAG SHOVEL EQUIPMENT suitable for application to Bucyrus-Erie 1030, 1035, or 32-B machines now in the field, consisting of 17-foot 1½-inch boom, 11-foot dipper handle, and two ¾-cubic-yard dippers: one 38-inches wide over cutters—the other 49½-inches wide over cutters, together with auxiliary A frame and ropes. Priced below cost. Box 381-SS.

For Sale or Rent

MODEL 7 NORTHWEST dragline, equipped with Kohler lighting plant, 65-foot boom, 1½-yard bucket. Koehring shovel. Model 301.
Address replies to Box 361-SS.

FOR SALE—AMERICAN STEAM DITCHER, equipped with ¾-cubic-yard bucket, mounted on flange wheels for off the car service and including caterpillar mounting. Machine in excellent mechanical condition. Located in Southeastern Arkansas. Box 159-SS.

RECONDITIONED TYPE-A BUCYRUS-ERIE STEAM SHOVEL on caterpillars, ⅝-cubic-yard dipper, 16-foot boom, 13-foot dipper handle, boom hoist, Massachusetts boiler. Machine thoroughly inspected, worn parts replaced. Guaranteed to be in first class operating condition. Will rent or sell. Box 37-SS.

20-B BUCYRUS-ERIE DIESEL SHOVEL with 36-foot dragline boom. Machine No. 4133.

20-B BUCYRUS-ERIE STEAM SHOVEL with 36-foot dragline boom. Machine No. 4145.

BUCYRUS-ERIE GAS + AIR CRANE with 40-foot boom, ¾-yard Page Dragline bucket. Fairleads and shovel boom, no dipper stick. Machine No. 4347.

TYPE B BUCYRUS-ERIE High Lift Steam shovel. Machine No. 3110.

Box 373-SS.

BYERS BEARCAT, Model 27, gasoline ½-cubic-yard Skimmer scoop, crane-clamshell and drag shovel with front opening dipper. Engine—4-cylinder, 4"x5" Hercules Model OX. Machine new July 1928. Excellent condition. Box 293-SS.

TYPE B BUCYRUS-ERIE COMBINATION HIGH LIFT STEAM SHOVEL, 19-foot 8-inch boom, 16-foot dipper handle, ¾-cubic yard dipper, power boom hoist and 36-foot boom clamshell equipment complete. Located central Indiana. Price as is, f.o.b. present location $2,000. Box 311-SS.

ONE P&H MODEL, 208 45' boom dragline (no bucket). "Cats" 15½' long, 9' wide, 22" treads, 100 H.P. Waukesha High Altitude Engine. Box 249-SS.

BUCYRUS-ERIE GA-3 GAS-AIR HIGH LIFT SHOVEL, 22-foot 6-inch boom, 16-foot dipper handle, 1¼-cubic-yard dipper, electric starter, steel cab, single shaft "cat". Wisconsin 6-cyl. 5¼"x6½" Gas Engine, shipped from factory July, 1932. This machine very latest design. Factory guarantee. Will sell or rent. Box 388-SS.

BUCYRUS-ERIE REBUILT HIGH LIFT STEAM SHOVEL, 19-foot 9-inch boom, 16-foot dipper handle, ⅞-yard dipper, power boom hoist, "cat"-mounted. Excellent condition. Will sell or rent. Box 386-SS.

BUCYRUS-ERIE SLIGHTLY USED ½-CUBIC YARD Rope crowd gasoline shovel. Will demonstrate. Box 282-SS.

MARION MODEL 32, shop No. 5459, mounted on "cats," steam-powered, 1¼-cubic-yard dipper, 24-foot boom, 17-foot 6-inch dipper handles. Box 82-SS.

ONE TYPE "B" BUCYRUS-ERIE STEAM MACHINE, mounted on "cats", ¾-cubic-yard dipper, shop number 2301, 19-foot boom and 16-foot dipper handle. Box 83-SS.

If You Do Not Find What You Want Listed—Write Us

Excavating Engineer
South Milwaukee, Wis.

MARION TYPE 32 FULL REVOLVING STEAM SHOVEL, shop number 4639, mounted on four belt caterpillar type mounting and equipped with standard boom and dipper handle and 1¼-cubic-yard dipper. Shipping point western Virginia.

This machine should be an excellent purchase at the price offered, for quarry or slag bank operation. Box 212-SS.

BUCYRUS-ERIE TYPE B STEAM SHOVEL caterpillar mounted, 19-foot 9-inch boom, 16-foot dipper handle. ¾-yard dipper, boom hoist. New 1924. Excellent condition; new flues in boiler. Located near Chicago. Priced to sell. Box 157-SS.

BUCYRUS-ERIE TYPE-B REBUILT high lift steam shovel. Will rent. Guaranteed. Box 285-SS.

REBUILT GA-2 BUCYRUS-ERIE SHOVEL mounted on single shaft caterpillar, 1¼-cubic yard inserted tooth dipper, 22-foot 6-inch boom, 16-foot dipper handle, starter. Carries guarantee of new machine. Box 43-SS.

MARION MODEL 21 AC-DC electric shovel, 20-foot boom, 15-foot dipper handle, ⅝-cubic-yard dipper. Suitable to operate on power-supply 3-phase 60-cycle 220 or 440 volt. First class condition. Box 208-SS.

ORTON SHOVEL, new 1928. 16-foot 4-inch boom, 12-foot dipper handle. ⅝-cubic-yard dipper. Box 100-SS.

INSLEY ½-CUBIC-YARD SHOVEL, full-revolving. Shop number about R-200 (2 years old). Machine in excellent condition. Has had best of care. Located in Wisconsin. Box 238-SS.

20-B BUCYRUS-ERIE STEAM SHOVEL, serial number 4000; caterpillar mounted; 18-foot boom, 12-foot 6-inch dipper handle, 1-yard dipper; shipped new in 1923; located western Missouri. Bargain. Box 241-SS.

BUCYRUS-ERIE SLIGHTLY USED 1035 gas friction shovel, factory inspected, new machine guarantee. Rope Crowd, 23-foot boom, 15-foot dipper handle, ⅞-yard dipper, including Kohler light plant installed. Exceptional bargain. Box 382-SS.

P&H MODEL 600. New 1929. 20-foot shovel boom, 14-foot 3-inch Dipper handle, 1-yard Dipper. Also 40-foot boom Clamshell Dragline Equipment. Waukesha 75 H.P. Engine. Box 218-SS.

BUCYRUS-ERIE EXTRA HIGH LIFT B-2 STEAM SHOVEL, 21-foot 3-inch boom, 18-foot 4-inch dipper handle, ⅞-yard dipper, power boom hoist, single shaft "cat". Located Massachusetts. Good condition. Priced very low. Box 385-SS.

UNIT MODEL B three-quarter swing, ⅜-cubic-yard Shovel. New 1928. Excellent Condition. Box 350-SS.

BUCYRUS-ERIE TYPE "GA-2" GAS+AIR SHOVEL, shop number 4117, mounted on spur gear drive caterpillar trucks, and equipped with a 24-foot boom; 18-foot, 4-inch dipper handle; 1-cubic-yard manganese cast front socket inserted tooth dipper; power boom hoist; air self-starter, and all equipment and appurtenances in accordance with the specifications of Bucyrus-Erie Company, f.o.b. cars shipping point Virginia. Box 126-SS.

USED BUCYRUS-ERIE 30-B DIESEL SHOVEL —25'9" Boom, 14' Dipper Handle, Box 251-SS.

Bay City Tractor-chain crowd ⅜-yd. shovel. "Cat" mounted. Includes clamshell attachment and bucket. McCormick-Deering power unit. New as clamshell 1928. Shovel equipment new 1932. Very good condition. Low price. Box 391-SS.

P. & H. MODEL 206 Gasoline Combination Shovel and Clamshell machine. Good condition. Located vicinity Chicago. Box 336-SS.

THEW "O" ¾-cubic-yard gas shovel rebuilt 1931 and mounted on new center drive "cat". Box 343-SS.

BUCYRUS-ERIE D-2 DIESEL RECONDITIONED AND GUARANTEED 1-cubic-yard shovel and 40-foot boom dragline equipment. Box 284-SS.

P&H MODEL 204. Shop number above 2200 combination Shovel Clamshell. 19' shovel boom, 14' 6" dipper handles, ½ cubic yard dipper, 35' clamshell boom, ½ cubic yard Owens Type M digger type bucket. Both front end equipments less than one year old. Excellent condition. Box 254-SS.

BARGAIN

Bucyrus-Erie Type B number 1982, ¾-yard steam shovel on caterpillar mounting with dragline attachment. Ideal for Construction work or Placer mining. Good condition. located Colorado Springs, Colo. Price right. Box 362-SS.

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

Small Shovels
Under 2 Yards
Continued

LINK-BELT GAS SHOVEL, one-yard dipper, 22-foot boom, 16-foot dipper handle, Waukesha JL 6"x7" motor. Good operating condition. Box 377-SS.

BUCYRUS-ERIE 1030, ¾-cubic-yard rope crowd gasoline shovel. Factory rebuilt and guaranteed. Box 283-SS.

TYPE B-2 BUCYRUS-ERIE STEAM SHOVEL, number 9830, mounted on single shaft caterpillar type mounting. Equipped with 21-foot 3-inch boom, 16-foot dipper handle, ⅞-cubic-yard inserted tooth dipper. Boom hoist and Mass. standard boiler. Located vicinity of Boston. Reasonably priced. Box 345-SS.

BUCYRUS-ERIE brand new 1035 gasoline shovel, rope chain crowd. Also clamshell or dragline equipment. At price you cannot refuse to consider. Box 356-SS.

BUCYRUS-ERIE GAS+AIR Combination high lift shovel and dragline equipment. Chain drive. "Cats." Very good condition. Located vicinity Chicago. Box 337-SS.

P&H MODEL 600—1-yard Gasoline Shovel. Three years old. Excellent condition throughout. Just been thoroughly overhauled. Will sacrifice at bargain to responsible buyer. Located in Wisconsin. Box 363-SS.

BUCYRUS-ERIE B-2 HIGH LIFT STEAM SHOVEL, 19-foot 9-inch boom, 16-foot dipper handle, one-yard inserted tooth dipper. Good operating condition. Price this machine could be earned and paid as rent within a few months. Box 383-SS.

USED P&H MODEL 700 gasoline, combination shovel-dragline, shop number 3007, including 1¼-cubic-yard drag scraper bucket. Dragline boom 40-foot plus 10-foot extension, shovel boom 25-foot 10-inches, dipper handle 19-foot 3-inches, dipper 1¼-cubic-yard. Engine Waukesha Type WL 4 cylinder 6¼"x7". Good condition. Some repair parts on hand. Machine located Tilleda, Wisconsin. Box 378-SS.

NORTHWEST SHOVEL, model 105, caterpillar mounted, 24-foot boom, 1-cubic-yard dipper, 16-foot dipper handle. In good condition. Price $4,500, f. o. b. Utica, New York. Box 34-SS.

BUCYRUS-ERIE 21-B GAS FRICTION SHOVEL, 18-foot 6-inch boom, 14-foot dipper handle, ¾-yard dipper, chain crowd, single shaft "cat". Wisconsin B-3 4-cyl. 5½x6½-inch engine. Shipped from factory August, 1931. Excellent condition. Sale price approximately one-half new selling price. Will rent. Box 387-SS.

BUCYRUS-ERIE TYPE B-2 high lift steam shovel "Cat" mounted. Good operating condition. Will rent. Priced to sell. Box 286-SS.

MARION STEAM SHOVEL, MODEL No. 21, high lift boom, and forward drum, boiler just retubed, location near Baltimore, in excellent condition. Price $1,800. Address Box 267-SS

AMERICAN 1-CUBIC-YARD GASOLINE SHOVEL. Motor overhauled 1932. Excellent condition. Will rent. Box 357-SS.

BUCYRUS ERIE So. Milwaukee, Wis.

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FACTORY REBUILT and USED SHOVELS--CRANES--DRAGLINES

Please send me full details on:

- ☐ B-E ⅞-yd. Gas Shovel. Slightly used.
- ☐ P. & H. 600 1-yd. Shovel-Dragline.
- ☐ B-E 32-B Gas Drgln. 45-ft. boom. Like new.
- ☐ Lorain 55 1-yd. Shovel. A-1 condition.
- ☐ Osgood "Conqueror" 1-cubic-yard gasoline shovel. 6 cylinder Le Roi Engine. Starter battery lighting system. Good condition.
- ☐ Monighan Dragline 60-ft. boom. Priced right.

Name .....

Address .....

Small Draglines
Under 2 Yards

P & H Model 206 B Dragline. Good operating condition. Very favorably priced. Box 390-SD.

BUCYRUS-ERIE D-2 DIESEL one-cubic-yard shovel. Also 40-foot boom dragline equipment. Reconditioned and carries new machine guarantee. Box 284-SD.

BUCYRUS-ERIE GAS+AIR combination high lift dragline and shovel. Chain drive. "Cats." Excellent condition. Located vicinity Chicago. Box 337-SD.

BUCYRUS-ERIE E-2 DIESEL DRAGLINE, caterpillar mounted, 50-foot boom, 1¼-cubic-yard Omaha bucket, Kohler lighting plant. Machine was new in July 1930 and has been used less than 6 months. Box 243-SD.

P&H MODEL 700 USED GASOLINE COMBINATION DRAGLINE-SHOVEL, shop number 3007, 40-foot dragline boom plus 10-foot extension and 1¼-cubic-yard drag scraper bucket. 25-foot 10-inch shovel boom, 19-foot 3-inch handle and 1¼-cubic-yard dipper. Waukesha Type WL 4 cylinder 6¼"x8" engine. Good condition. Some repair parts on hand. Machine located Tilleda, Wisconsin. Box 378-SD.

MONIGHAN DRAGLINE, 60-foot boom, mounted on 1-W walker and 1¼-cubic-yard Page bucket. Good condition. Price right. Box 339-SD.

BUCYRUS-ERIE TYPE D-2 DIESEL DRAGLINE, shop number 5055, 45-foot boom and 1 cubic-yard Page Class "M" drag bucket. Located Eastern Missouri. Priced to sell. Box 166-SD.

30-B BUCYRUS-ERIE DIESEL DRAGLINE with 40-foot boom and 1-cubic-yard bucket located in Alabama. Box 91-SD.

P & H MODEL 700 DRAGLINE: number 2894 equipped with a 50-foot boom, light 1½-cubic-yard drag bucket, electric light plant, and powered with 4-cylinder Atlas Diesel engine. Box 189-SD.

OSGOOD ONE-YARD gasoline combination Dragline-Shovel-Clamshell. Overhauled late in 1931. Six cylinder Beaver motor. Bargain price. Box 323-SD.

KOEHRING MODEL 1 GAS DRAGLINE 40-foot boom and Page M ¾-cubic-yard bucket. Good operating condition. Box 374-SD.

FOR SALE OR RENT

One practically new Bucyrus-Erie Model E-2 Dragline, Diesel driven, equipped with 50' boom and 1½-yard Omaha dragline bucket, now located at Shenandoah, Iowa. Box 244-SD.

P & H DRAGLINE MODEL 700: number 2456 equipped with a 50-foot boom, light 1½-cubic-yard drag bucket, electric light plant, and powered with a Waukesha gasoline engine. Box 190-SD.

BUCYRUS-ERIE SLIGHTLY USED 32-B Gasoline 45-ft. boom dragline and 1-yd. Page bucket. Like new. Box 352-SD.

Small Clamshells and Cranes
Under 2 Yards

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Large Shovels and Draglines
2 Yards and Over

50-B BUCYRUS-ERIE ELECTRIC SHOVEL, equipped with 3-phase A. C. current, 550 volts, 60 cycle and has three motors. New Manganese steel dipper. Located South Carolina. Box 226-LSD.

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For Sale or Rent

ONE CLASS-14 STEAM DRAGLINE excavator. Number 3402, 70-foot boom, 2-cubic-yard bucket, caterpillar mounted, equipped for burning gas or oil. Priced very reasonable. Located at Grand Prairie, Texas. Box 110-LSD.

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FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

Large Shovels and Draglines
2 Yards and Over
Continued

BUCYRUS-ERIE 50-B STEAM SHOVEL, number 4751. Equipped with 1¾-cubic-yard bucket. Shipped new August, 1926. Priced to sell. Located in East. Box 366-LSD.

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For Sale or Rent

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70-C STEAM SHOVEL located near Marietta, South Carolina, where it completed a railroad job? Bargain as supplementary shovel or as supply of spare parts.

88-C STEAM SHOVEL located in Kansas. Carefully laid up after completing season's work. 3½-yard dipper. Fine condition. Any reasonable offer accepted. Box 52-LSD.

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BUCYRUS 70-C, Shop number around 1500. Thoroughly overhauled. Good working condition. Eastern location. Box 299-LSD.

50-B STEAM SHOVEL, Number 3946; equipped with 1½-cubic-yard dipper, 26-foot boom, also 1½-cubic-yard dragline bucket with 50-foot boom caterpillar mounted, equipped for burning oil, located at Texarkana, Ark. Price very reasonable. Box 112-LSD.

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DIESEL-ELECTRIC DRAGLINE

Class 14 Diesel electric dragline, Shop Number 5079, new fall of 1927 with 70-foot boom, 2-cubic-yard bucket, and with extra 10-foot extension, western location. Box 296-LSD.

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For Sale or Rent

Two 40-ton, 6-wheel switchers. Recently overhauled and rebuilt. Two 50-ton, 6-wheel switchers. In excellent condition. Location Chicago. Box 306-ME.

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2—LOCOMOTIVE BOILERS 54"x11'x3" 92 H.P.—Under forced draft. 125 pounds working pressure. 463 square feet heating surface. Heavily built for steam shovel service.

3—LOCOMOTIVE BOILERS 44"x17' 75 H. P. Under forced draft. 125 pounds working pressure, 393 sq. ft. heating surface. Heavily built for Shovel service.

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Box 332-ME.

WANTED

Used electric welding outfit, 200 ampere capacity. Must be in good condition. Address Box 379-ME.

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8 BALDWIN, 17x24, straight drive standard gauge 45 ton locomotives. 54 inch boilers. Shop numbers from 32,750 to 34,611. Each one has passed State Boiler Inspection yearly. Boilers will stand cold water test of 240 lbs. At present in actual service in Minnesota mine.

2 BALDWIN Locomotives, 19x26, standard gauge, 6 wheel switching type, shop numbers 39534 and 39536. Box 152-ME.

DUMP CARS

6—8-yard Western — 36-inch Gauge — 2-way side.

LOCOMOTIVES

1—15-ton, 10x14 — 36-inch Gauge — Vulcan Saddle Tank.
2—21-ton, 11x16 — 36-inch Gauge — Vulcan Saddle Tank.

BOILERS

1—100 h.p. Locomotive Type for 70-C Bucyrus shovel.
1—32 h.p. Locomotive Type Stationary.

Box 181-ME

LOOK AT THESE OFFERS

2—MOTORS, type KTR-3958, 8 pole, 21.5 HP, 900 RPM. Form GA- 440 V., 3 phase, 60 cycle, 160 amp. maximum torque 350' lbs. (5 min. 55°C) totally enclosed ball bearing, Model Number 74A157.

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2—BLOWERS, Type CW, top horizontal discharge No. 75, Design No. 2, silent vane fan for continuous service, delivery to 7500 RPM direct connected to motor KT-946, 5-HP., 440 Volts, 3 phase, 60 cycle.

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2—11"x11"x12" WESTINGHOUSE AIR COMPRESSORS.

1—MOON 1 KW TURBO GENERATOR LIGHTING PLANT.

1—50KW MOTOR GENERATOR SET. Induction Motor, Model No. 10059, type KT 347-6-75-1200. Form B, 3 phase, 60 cycles, 440 volts, 93.5 amps. speed full load 1170 RPM. No. 4405940, 75 HP. Continuous, connected to:

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1—GENERATOR Westinghouse 125 KW-250 Volts—500 Amperes, 440 RPM. DC-Generator, Serial No. 4,992,129 with two outboard bearings.

Box 372—ME

FOR SALE

Address all box numbers c/o Excavating Engineer at South Milwaukee, Wisconsin

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Continued

COMPLETE EQUIPMENT for 2 strip mines, contractors or quarry operations, No. 300 and No. 36 Marion steam shovels, well drills, locomotives, cars, crushers, picking tables, loading booms, cable and button retarders, compressors, motors, transformers, flood and search lights, camp equipment and new repair parts for above. Box 195-ME.

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1—"LITTLE TUGGER" STEAM HOIST ENGINE No. 1-H5—2½ H. P. (Ingersoll Rand—Form 4333 Page 15).

17—BRAND NEW 75 H.P. 7"x8½" STROKE. 4 CYLINDER ATLAS DIESEL ENGINES. Non-reversible. Complete with auxiliary air compressor and fuel tank. Will sell without auxiliary compressor and fuel tank.

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3—4½"x5" REVERSIBLE STEAM ENGINES—20.8 H.P. at 400 RPM. Normal running speed at 100 pound steam pressure.

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2—5"x5" REVERSIBLE STEAM ENGINES—25.6 H. P. at 400 RPM. Normal running speed at 100 pound steam pressure.

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Excavating Engineer

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Size	Model	Power Choice			Type
½-yard	16-B	gasoline	Diesel	electric	fully convertible shovel, dragline, clamshell, lifting crane, skimmer-scoop, drag-shove
½-yard	1020	gasoline	Diesel	electric	fully convertible
¾-yard	21-B	gasoline	Diesel	electric	fully convertible
⅞-yard	B-3	steam			fully convertible
1-yard	32-B	gasoline	Diesel	electric	fully convertible
1¼-yard	GA-3	Gas + Air			fully convertible
1½-yard	37-B	gasoline	Diesel	electric	fully convertible
1½-yard	42-B	electric	steam		fully convertible
1¾-yard	43-B	gasoline	Diesel	electric	fully convertible
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573

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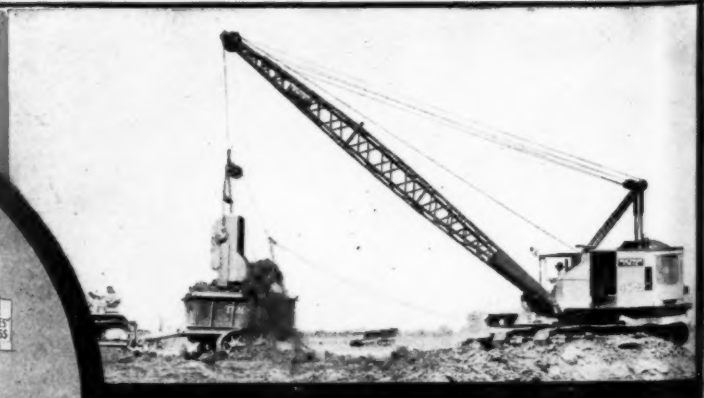
South Milwaukee, Wisconsin



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Vol. XXVII APRIL 1933 Number 4

EXCAVATING ENGINEER

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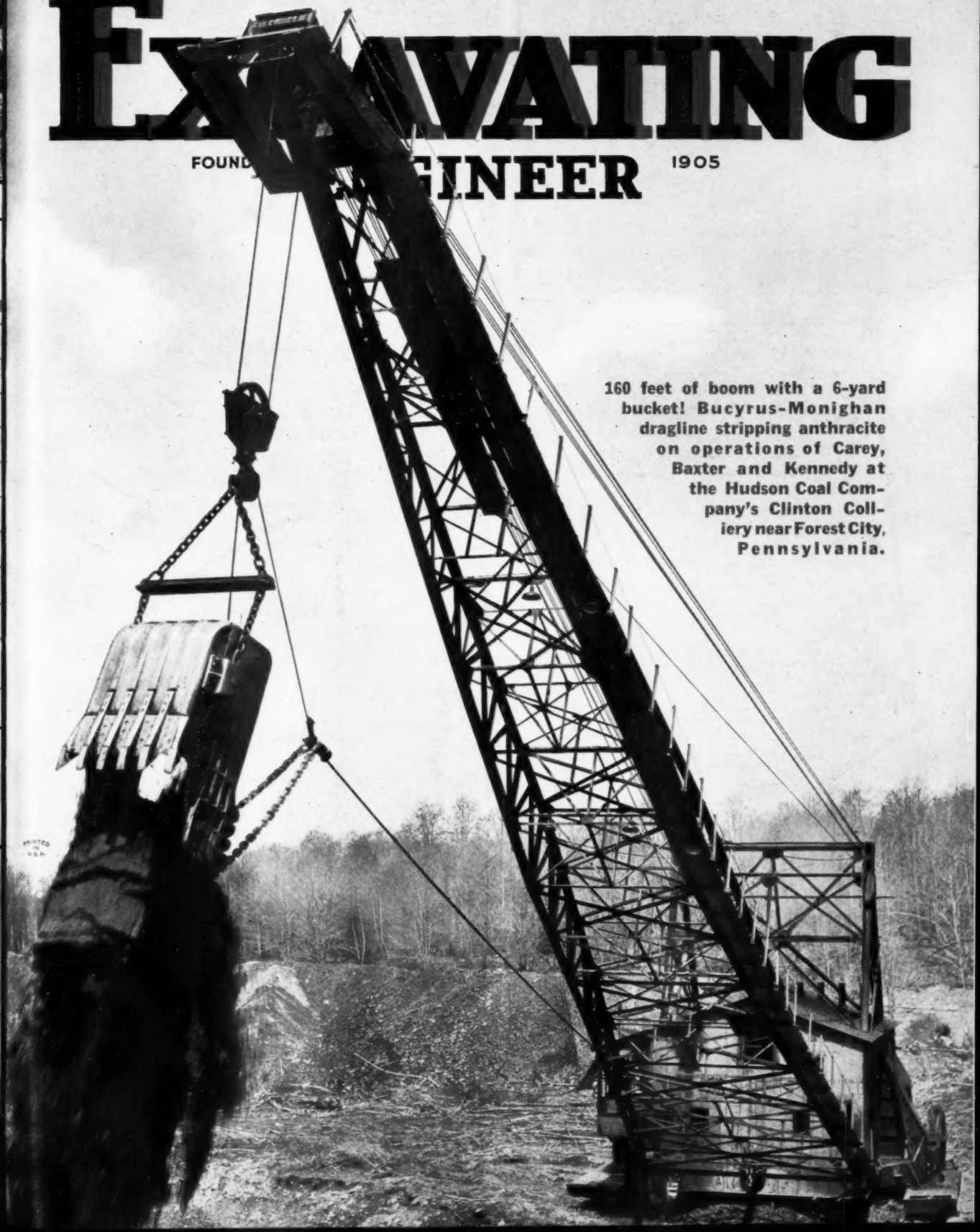

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RIGHT *where you want it!*

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Clamshells : Dredges
Tower Excavators
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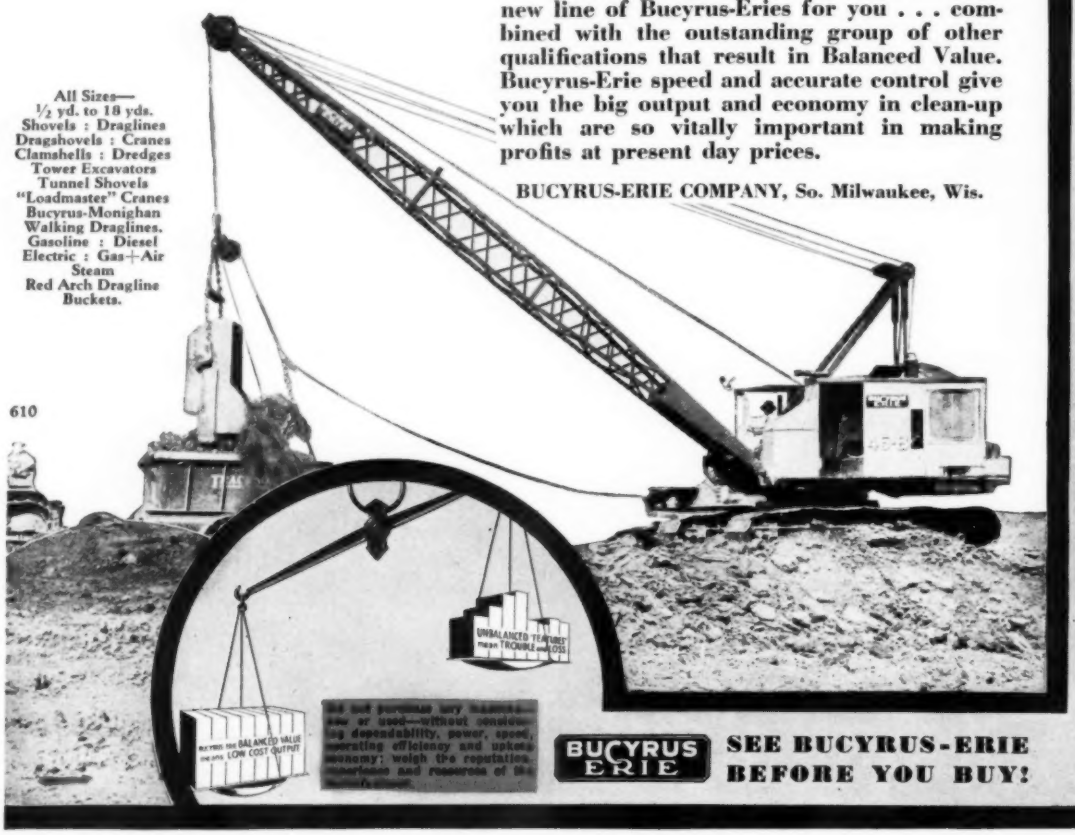
610



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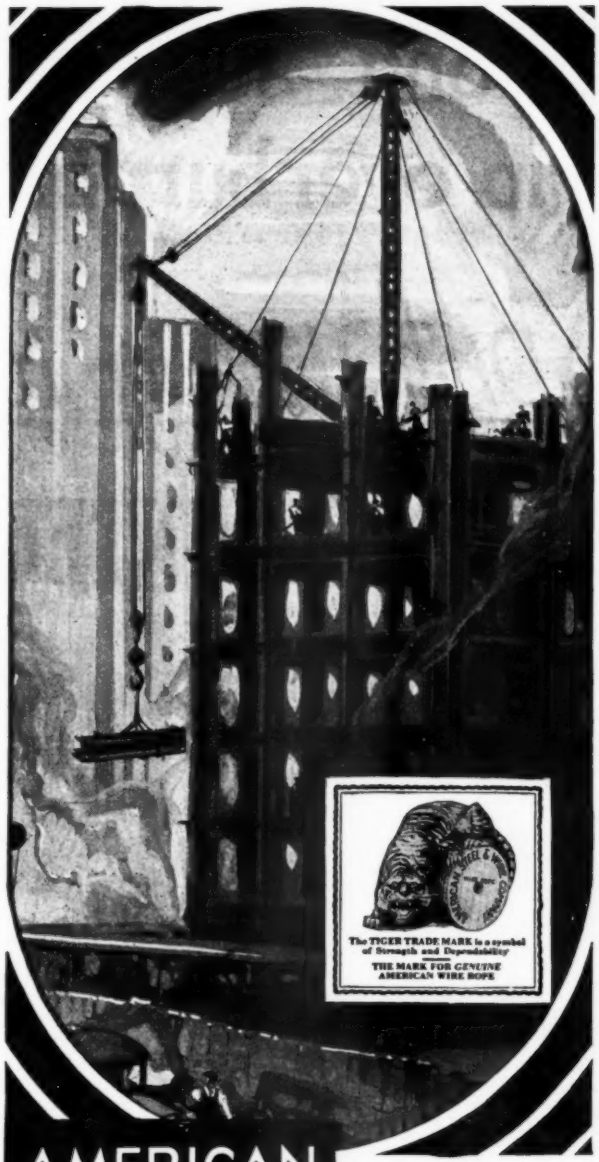

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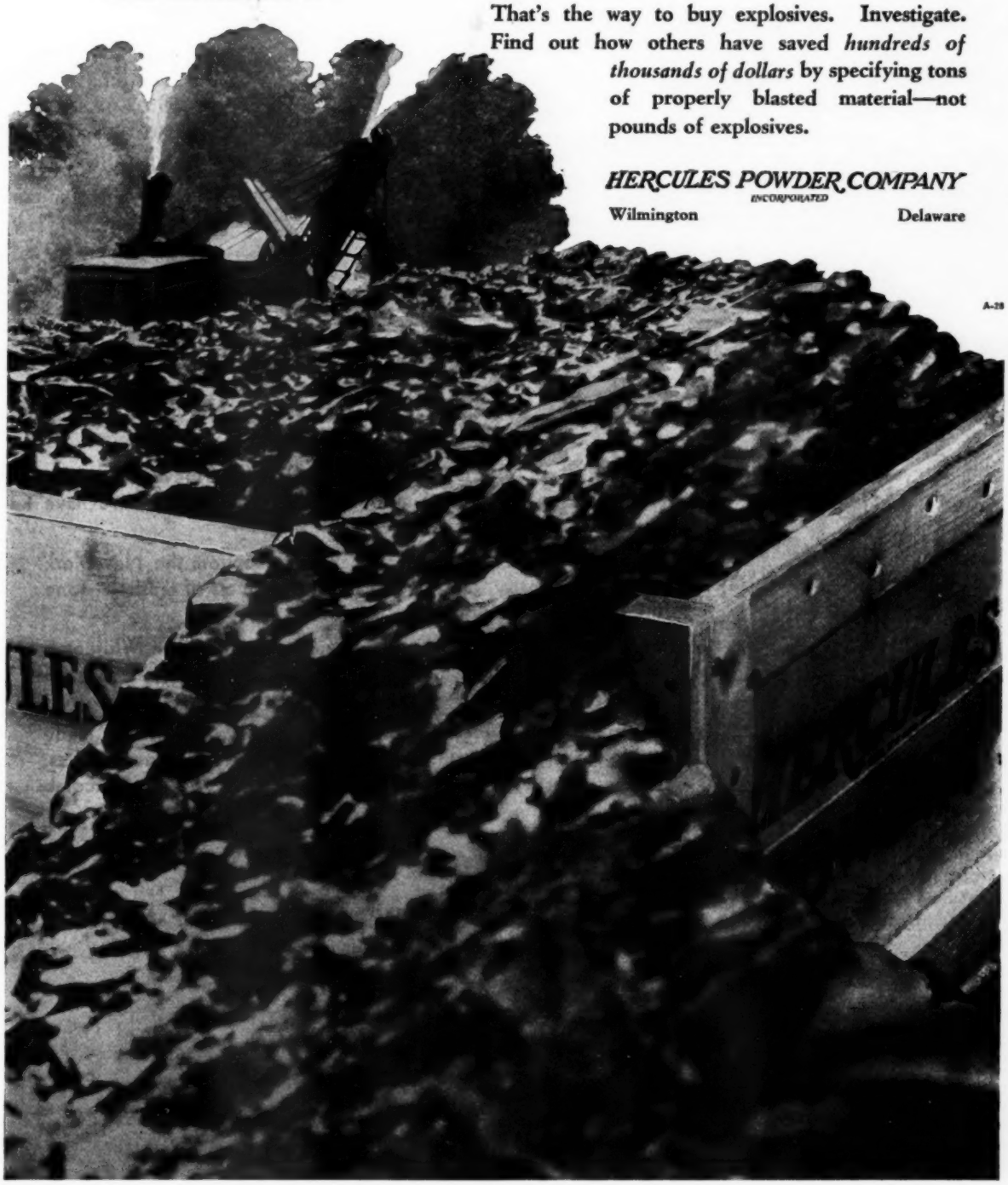

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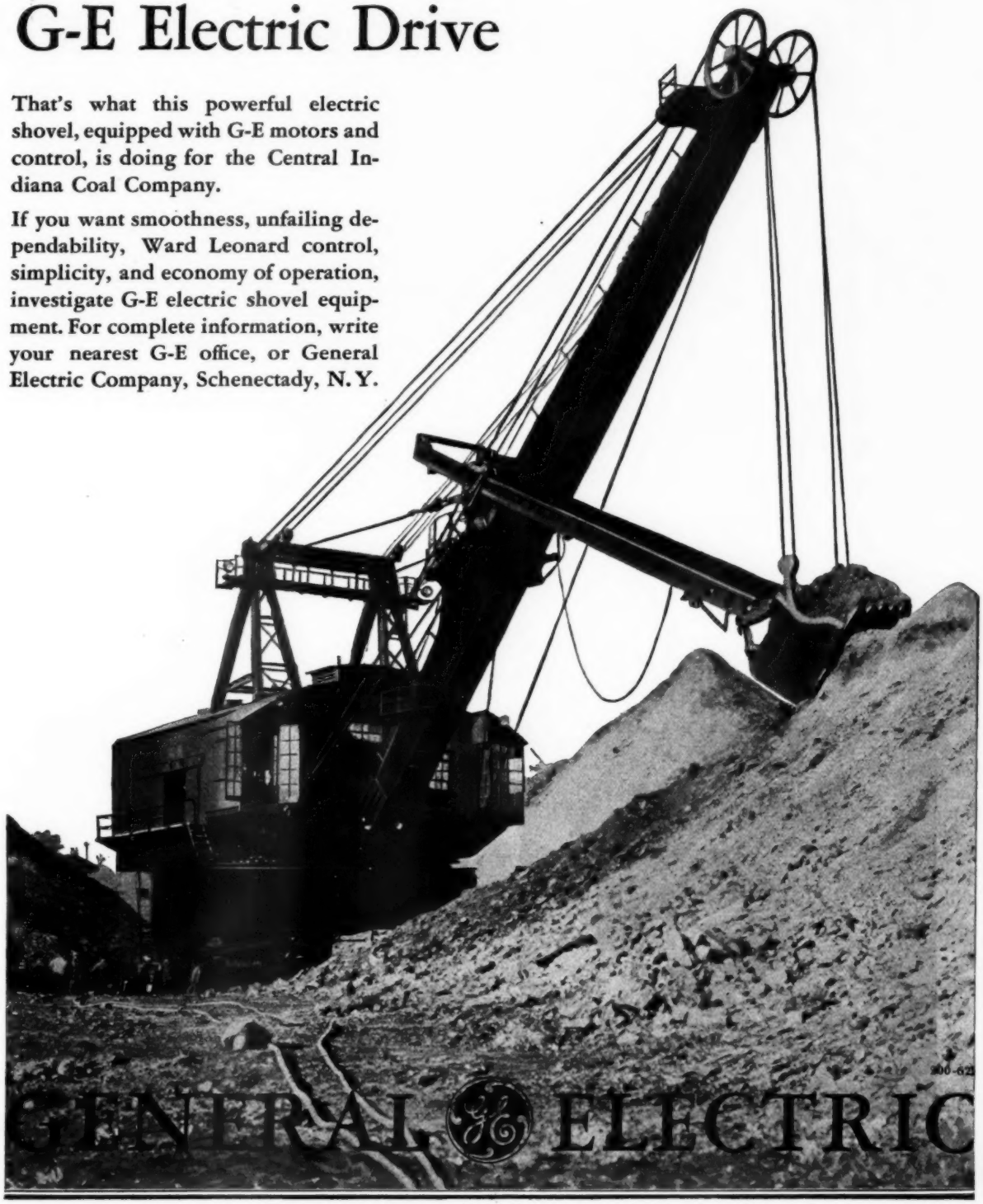

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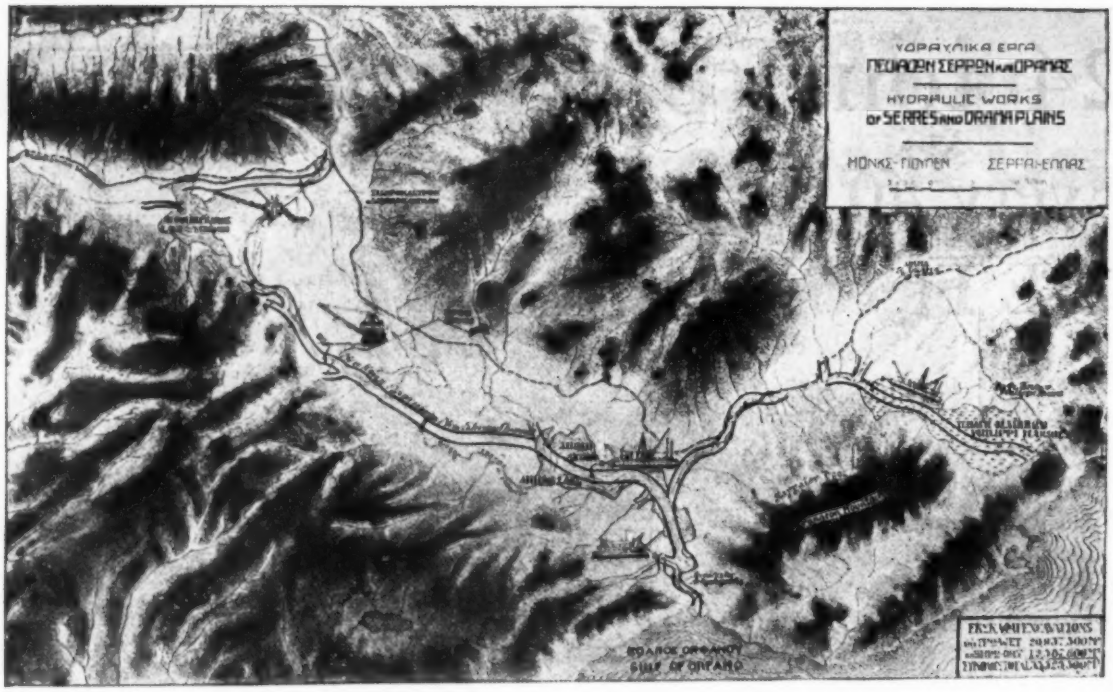

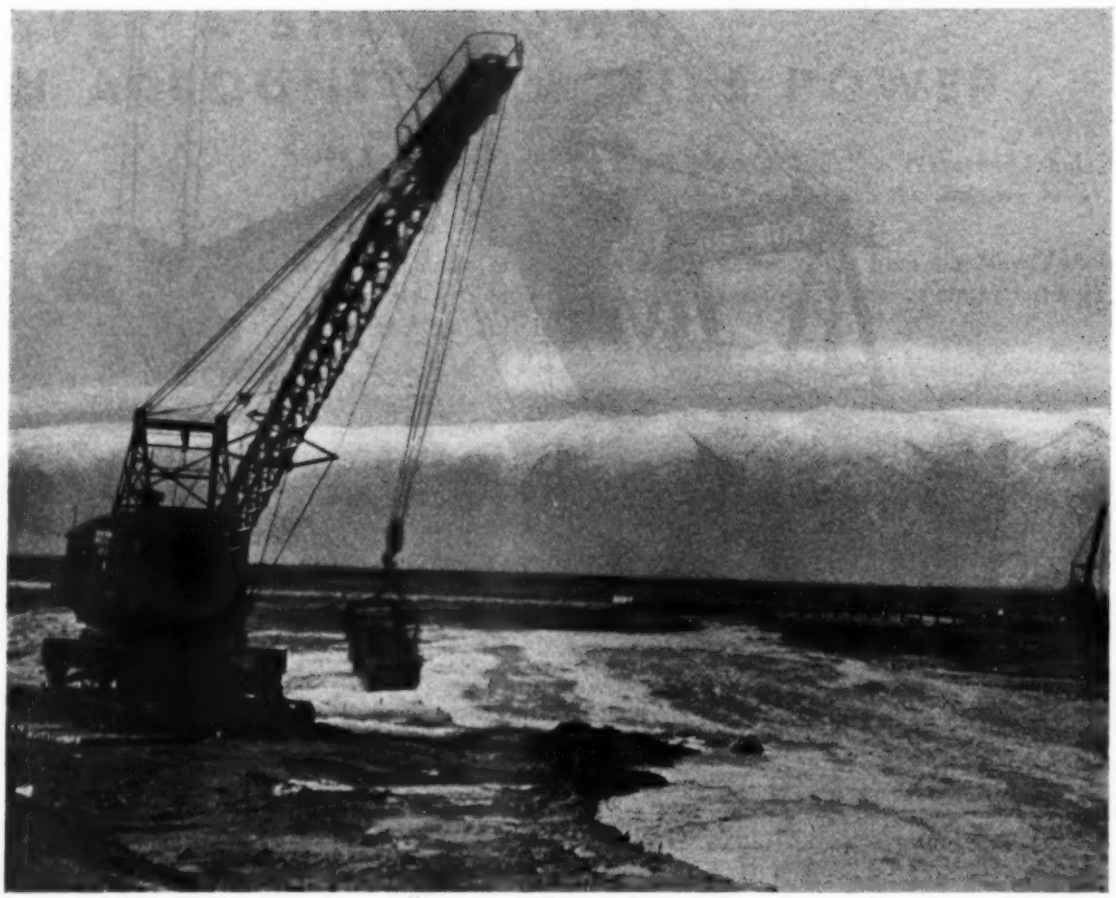

● *Map of the Serres and Drama projects and (below) two of the Bucyrus-Erie draglines deepening the channel and building embankments in the Serres plain. Kerkinii Mountains in the background show their snow caps faintly against the sky.*